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Performance Measures for Managerial Decision Making: Performance Measurement Synergies in Multi-Attribute Performance Measurement Systems

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Performance Measures for Managerial Decision Making: Performance Measurement Synergies in Multi-Attribute Performance Measurement Systems

by

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ABSTRACT

This research tests for correlation between corporate performance and use of financial measures, nonfinancial measures, and number of balanced scorecard categories used. Literature notes a preference for managing by nonfinancial measures because financial measures are lagging indicators, but little empirical evidence is available on the relationship between nonfinancial measures and financial performance, and few companies are found to realize the benefits of nonfinancial measurements. The balanced scorecard has been studied to find the impact of diversity of performance measures, and anecdotal improvements have been reported, but there is a paucity of empirical evidence regarding how the use of a balanced scorecard impacts organizational performance.

These issues are investigated in this research with a web based survey distributed to a sample of publicly traded companies using a systematic selection process based on randomly selected numbers generated for each 3-digit NAICS category. The dependent variable is a rank of high, medium or low performance based on 12-month rolling average stock price comparisons from January 2005 to January 2009. These averages are analyzed as a percent change for each company, with performance standardized by 3-digit NAICS category to eliminate cross industry variance in performance ranking. Kruskal-Wallis one-way ANOVA is used to test for correlation.

High performers show greatest utilization of both financial and nonfinancial measures, followed by medium performers, with low performers utilizing both measures

the least. Nonfinancial performance measures are more correlated to firm value than financial measures with the high performers' mean score for nonfinancial measures being higher than for financial measures. By contrast, medium and low performers exhibit the opposite: higher mean scores for financial measures than for nonfinancial measures [$p \leq 0.05$ for nonfinancial measures and $p \leq 0.1$ for financial measures]. Correlation is found to be borderline significant ($p = 0.06$) for the number of balanced scorecard categories used with high performers utilizing the highest number of categories and low performers utilizing the lowest number of categories [$p = 0.009$ with inclusion of two respondents reporting no usage of balanced scorecard categories].

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Finally, I am most grateful to my family for their support: my wife, Kelli; my children Sarah, Chelsea, Steven and Lacy; and my parents for their belief in the value of education.

With so much help from many sources, I have only myself to blame for flaws that remain.

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PREFACE

This document is presented as it evolved with Chapters I through IV documenting proposed research as of 2008. The final two chapters document the results, and provide a discussion of the research conducted from 2008 to 2010. Therefore, Chapters I through IV are written in form referring to proposed future activities and conclusions that may or may not be realized as documented in Chapters V and VI.

CHAPTER I

INTRODUCTION

The premise of this research project is that the firm (any business organization) is a complex dynamic system, and is a subsystem of a larger (meta) dynamic system (value chain) which operates within an even larger dynamic system (market). The purpose of this project is to show that the selection of specific subsystems of the firm for measurement (feedback) and the types of measurement used correlate to firm performance (value). To establish the context, to define the subsystems and performance measures under consideration, the firm as a complex dynamic system is now described.

The Firm as a Complex Dynamic System

The firm is a subsystem of a larger value chain system (see Figure 1 – colored boxes at bottom relative to this study -- for a detailed description see Appendix A). The value chain, comprised of upstream (Pre-Firm Value Chain) and downstream (Post-Firm Value Chain) subsystems, provides value to the metasystem environment. The firm attempts to optimize its performance based on relationships with other firms in the value chain; also by monitoring and adjusting performance of its own subsystems using a number of financial and nonfinancial performance measures.

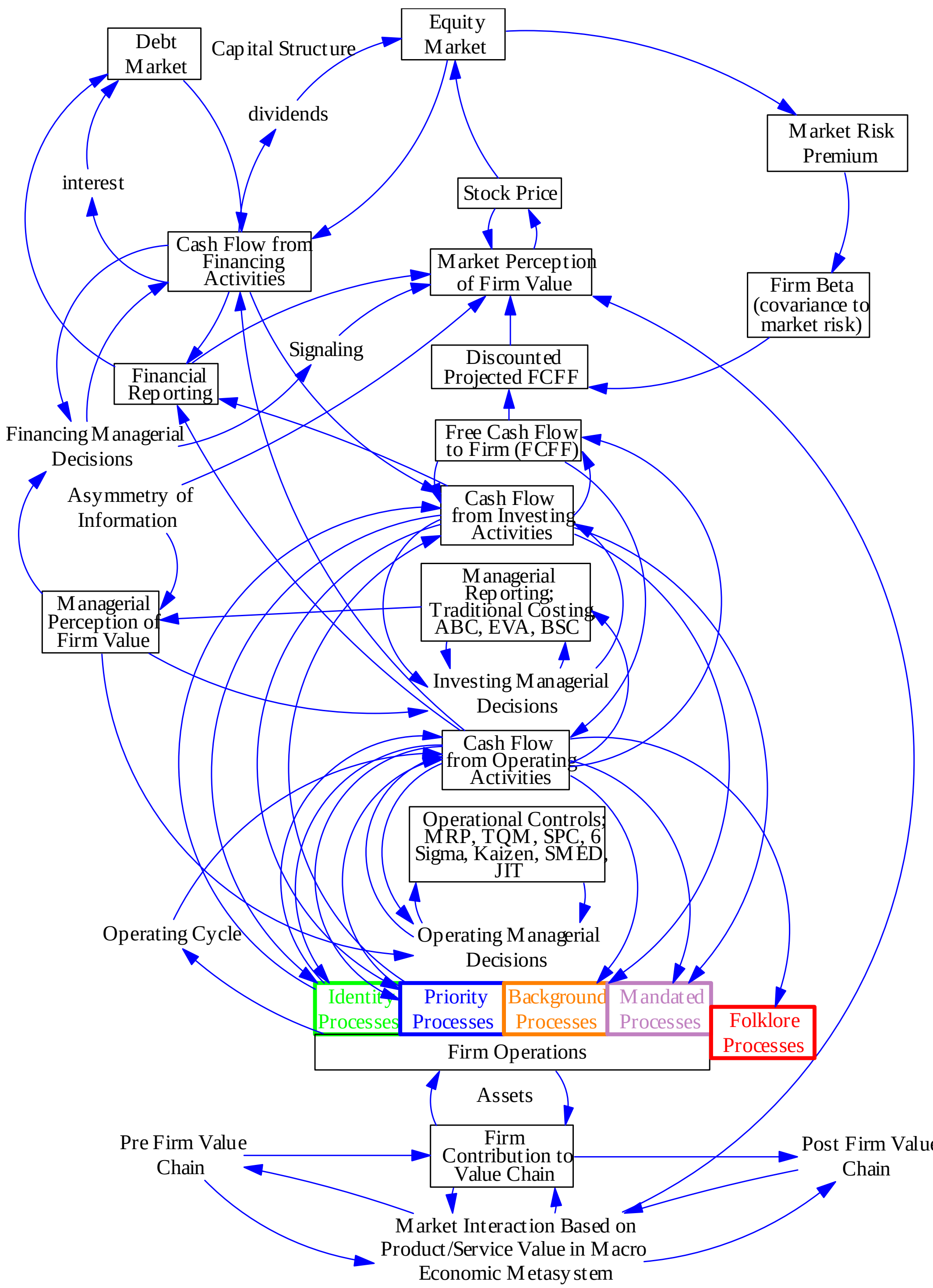


Figure 1: The Firm—A Systems Perspective

Assets are managed by the firm using a variety of processes to generate cash flow, which creates value. For the purpose of this research, processes considered are Identity, Priority, Background and Mandated processes which are all "…coordinated activities that involve people, procedures, and technology" (Keen, 1997, p. 13). These processes are used throughout the firm system and require the use of resources (cash flow), but not all processes make a positive contribution to cash flow. Literature notes the value of nonfinancial measures (Chow & Van der Stede, 2006), and even a preference for managing by nonfinancial measures because financial measures are after-the-fact, so using these measures does not fully address the issue of optimizing performance. Although it is true that managing by nonfinancial measures gets one "closer" to the process, this does not get to the heart of the process structure because it does not "quantify" the process structure or the "value added" components of the structure. Are there fundamental process related measures? Many companies identify Key Performance Indicators (KPI), but do the indicators truly represent "Key" processes driving profitability and success? The Balanced Scorecard proposed by Kaplan and Norton (1996) has tried to address the comprehensive nature of performance measurement requirements based on Financial, Customer, Internal Business Process, and Learning and Growth metrics, but are these measures all "Key"?

All processes used within the firm system impact management information, cash flows, market perception of value, and ultimately the stock price of the firm. This study will test the following subset of this complex dynamic system to find synergies in performance measurement systems that correlate to stock price behavior:

- Based on Keen's perspective (1997) the Salience (Identity, Priority or Background) of the process selected for measurement impacts firm value (H_1). An *identity* process is one that defines the company for itself, its customers, and its investors. *Priority* processes are the engine of corporate effectiveness. They strongly influence how well identity processes are carried out and how a firm stands relative to its competition. *Background* processes are a necessary support to daily operations. Many administrative and overhead functions are background processes.
- A number of studies, including Chow and Van der Stede (2006), suggest that nonfinancial measures are better than financial measures for improving performance because financial measures are lagging indicators (H_2)
- The concept of clockspeed as introduced by Fine (1998) in conjunction with the systems concept of feedback delay implies that the impact of financial vs. nonfinancial measures will be accented in high clockspeed industries (H_3). Clockspeed is a term used to designate the rate of change of product, process, or technology with high clockspeed designating rapid change.
- The balanced scorecard concept introduced by Kaplan and Norton (1996) increases firm value by assuring a balanced performance throughout the organization (H_4)

The development and statement of these hypotheses is the topic of Chapter 3, but the designations (H_{1-4}) are inserted throughout Chapter 2 to note the relevance and applicability of the literature review.

A web-based survey will be used for data collection. Respondents will remain anonymous and companies will be coded for confidentiality. The comparative dependent variable is the change in month-end stock price (positive change indicates increasing value). To eliminate seasonal and year-end distortions, the comparison will be based on a rolling 12-month average month-end stock price with the comparison based on a single specific end date for all companies tested. All materials used in the study will be retained for a period of three years.

This research project will contribute to the field by providing empirical evidence of the value of using a process orientation in performance measurement development, add empirical evidence regarding the value of financial vs. nonfinancial measures, confirm the impact of clockspeed as an important contingency in performance measurement selection, and measure the impact of using a balanced scorecard. These factors will be observed over a broad range of industries as defined by North American Industry Classification System (NAICS) code.

Chapter 2 provides a review of literature relevant to this study including: a history of traditional cost management, contemporary techniques, agency theory, contingency theory, activity based and economic value added measures, financial and nonfinancial performance measurement, clockspeed, and a description of systems definitions and concepts. Chapter 3 develops the theoretical basis for the questions and hypotheses under consideration. Chapter 4 defines the data collection and analytic methods to be used for the study. Chapter 5 documents the results, and Chapter 6 discusses the results and provides recommendations. Appendices are included which define the proposed project timeline, the summarized hypotheses, the proposed survey respondent consent form, a preliminary questionnaire, a sampling of company listings and comparisons, and supporting material for the test.

CHAPTER II

REVIEW OF THE LITERATURE

Traditional Cost Accounting

The history of traditional cost accounting is important because it shows how organizations have come to rely on financial measures as the primary source of information for management decisions (H_2).

Accounting, as evidenced by double-entry bookkeeping, finds its roots in Northern Italy in the 14th & 15th Centuries where it was formalized and published in 1494 (Davidson & Weil, 1978, Ch 1, p. 2). The double entry method at that time was used strictly for keeping records. In 1750 the method was adapted to order costing by an English shoemaker, and in 1777 was used in textile manufacturing to record quantities and values of weaving processes external to the firm (Davidson & Weil, Ch. 1, pp.4-5).

Accounting for textiles manufacturing in New England during the early 1800s saw a change from mercantile to industrial accounting. "Prior to this time, accounting was mercantile in that it simply established accountability for financial statement components and apportioned costs among different products and product lines" (Fleischman & Tyson, 1997, p. 366). The introduction of the power loom (Lowell mills) in the mid-1820s in the United States resulted in a large, full-time labor force whose production needed close monitoring and measurement. The work force became removed from the family and “employed” managers became responsible for costs and quality (Fleischman & Tyson, 1997, p. 367). According to Fleishman and Tyson (1997) “…accounting information was a necessity from the inception of the Lowell mills. Large, fully integrated facilities faced foreign and domestic competition in markets characterized by steadily falling market prices” (p. 368). As noted by Johnson (1981), “Managers of early textile mills could monitor employee performance with periodic cost information that compared productivity among workers in the same process at a specific time and that also compared productivity for one or more workers over several periods of time” (p. 514). This double entry system was used to obtain managerial cost information rather than to account for the costs of long-term assets.

During the time the Lowell Mills in the United States was utilizing accounting for industrial purposes, farm accounting in France was evolving to distinguish profits on cultivation from speculative profits (from holding produce after it had been raised). Long maturing investments like vineyards and woods were charged a per annum compound interest while maturing, and credited with the value of the produce obtained. Depreciation of equipment, buildings and improvements was taken account of by writing off the cost over the expected lives of the assets, at different rates even for different parts of the same asset, according to the durability of the part (Davidson & Weil, 1978, ch.1, p. 8). A publication in France in 1827 discusses “…depreciation and maintenance of buildings and plant, recognizes problem of pricing out materials that have been purchased at varying prices and favors a single average price for the year for each material and …

includes interest on capital among the expenses in … P&L account" (Davidson & Weil, 1978, Ch. 1, p. 7).

With the use of accounting for managerial costing increasing, "Charles Babbage, Lucasian Professor of Mathematics in University of Cambridge, puts forward [a] case for devotion of time and attention to costing *On the Economy of Machinery and Manufactures* (1832)" (Davidson & Weil, 1978, ch.1, p. 5).

Railroads as large, capital intensive institutions at this time also begin using accounting for managerial information:

> As early as 1831, the managers of the B&O [railroad] had observed fixed and variable cost behaviour [*sic*] and had understood certain 'cost drivers' pertaining to passenger and freight service. They even used measures such as freight ton-miles as part of their management control. From its inception, the B&O published various operating and comparative statistics such as total passengers and miles run, as well as tons carried and cost-per ton (Heier, 2000, p. 216).

In 1850 a 500-page treatise, *Railroad Economy*, published by Dionysius Lardner discusses the development of railroads and their operations in the United States, England and Europe. This treatise includes statistics to explain operations and explains factors that impacts railroad expenses (Heier, 2000, pp. 217-218).

It is at this time that agency theory issues begin to be recognized:

> Beginning in the mid-1850s, Henry Varnum Poor, publisher of *Poor's American Railroad Journal*, encouraged railroads to create and publish statistics such as ton-miles and revenue-miles so that the public could better evaluate their performance. Poor felt this was necessary because so many rail managers were not owners, and conflicts of interest between managerial motives and owners' expectations began to arise. The agency problems inherent with absentee ownership were just beginning to emerge (Heier, 2000, p. 218).

By 1869, operating statistics and cost data are being presented in annual reports, and standardized cost data are used to set shipping tariffs for freight and passenger service (Heier, 2000, p. 215). Though elaborate cost reporting and estimation schemes are used by the 1880s, overhead and capital costs are not considered in cost reporting (Kaplan, 1984a, pp. 392-393).

By 1900 the industrial uses of accounting are increasingly recognized by business people because of the increasing scale and complexity of business:

> In the iron industry, for example, the size of business and the degree of integration had ceased to be limited by the availability of water power. The coal mining industry had developed similarly; the sinking of deep shafts, construction of galleries, ventilation and pumping equipment, and transport all called for large capital investment. The textile industries had been transformed by the introduction of power machinery. Thus the importance of buildings, plant, equipment, and supervision, i.e., of overhead costs, had rapidly increased in relation to the prime costs of materials and labor. Larger bodies of labor had to be paid and controlled, complex processes to be organized and administered. Moreover, the development of railways, with their enormous volume of fixed equipment, had brought the problem of overhead to the fore (Davidson & Weil, 1978, ch.1, p. 10).

Standard costing appears in the early 1900s and evolves to the point of being an established practice by 1918 (Kaplan, 1984a, p. 394) and by 1919 "…the process of attaching overhead costs to units of product had been brought more or less to completion" (Davidson & Weil, 1978, Ch. 1, p. 17).

> After 1925 a subtle change occurred in the information used by managers to direct the affairs of complex hierarchies. Until the 1920s, managers invariably relied on information about the underlying processes, transactions, and events that produce financial numbers. By the 1960s and 1970s, however, managers commonly relied on the financial numbers alone (Johnson & Kaplan, 1987, pp. 125-126).

The end result of this reliance on "traditional cost accounting" financial measurement system is that managers rely on accounting numbers (H_2) and not on the processes behind the numbers (H_1).

<u>Contemporary Techniques</u>

A number of different contemporary techniques have been developed and studied. Contemporary techniques are important because they have been designed to improve organizational performance and value beyond that possible using traditional cost accounting alone. By the 1980s and 1990s increasing competition from globalization and the focus on the customer in the value chain highlight the need for alternative performance measurement systems. Heskett, Jones, Loveman, Sasser, and Schlesinger (1994) describe the concept of customer satisfaction driving profitability as follows:

> The links in the chain…are as follows: Profit and growth are stimulated primarily by customer loyalty. Loyalty is a direct result of customer satisfaction. Satisfaction is largely influenced by the value of services provided to customers. Value is created by satisfied, loyal and productive employees. Employee satisfaction, in turn, results primarily from high-quality support services and policies that enable employees to deliver results to customers (pp. 164-165).

Simons (1991) defines management control systems as "…the formalized routines and procedures that use information to maintain or alter patterns in organizational activity" noting that "…these systems include formalized information-based processes for planning , budgeting, cost control, environmental scanning, competitor analysis, performance evaluation, resource allocation, and employee rewards" (p. 49). The need for changes to traditional management accounting is noted by Kaplan (1984a) who states that management accounting "…cannot exist as a separate discipline, developing its own set of procedures and measurement systems and applying these universally to all firms without regard to the underlying values, goals, and strategies of the particular firms", but must "…serve the strategic objectives of the firm" (p. 414). Bromwich (1990) considers "strategic management accounting" and the importance that accountants consider the cost structure of not only the firm, but of all enterprises in the relevant market and even potential entrants. Costs cannot be considered separate from demand; therefore the accountant needs to consider whether the firm's cost structure allows its strategy to be sustainable in the face of potential entry. This second view considers demand and cost factors and their linkage, while highlighting the importance of fixed costs and sunk costs. Hemmer (1996) comments that to reinforce the long-term aspects of actions, "…modern management accounting incorporates, as a significant element, nonfinancial (and from an accounting standpoint, nontraditional) measures of customer satisfaction and defects" (p. 87). He further notes that little evidence has been found to determine under which conditions alternative designs perform well.

Chenhall and Langfield-Smith (1998) define a variety of combinations of strategies, management techniques and accounting practices used to pursue competitive advantage. The two strategic priorities noted are low price or differentiation as developed by Porter. Management techniques include improving existing processes, quality systems, manufacturing systems innovations, integrating systems (across functions and with suppliers and customers), team based structures, and human resource management policies. Management accounting practices include traditional techniques and contemporary techniques including benchmarking, activity-based costing, balanced performance measures, team-based performance measures, employee based measures and strategic planning (p. 244). They state, "…in high performing companies, these variables may act in combination to provide synergies or complementarities to enhance organizational performance" (p. 245). In a review of 320 different studies of performance, Capon, Farley and Hoenig (1990) note that "… results hint at the presence of strong interactive effects among variables (p. 1157)". They further note:

> There may be synergies (positive and negative) leading to various optimal combinations of factor inputs. Work on interaction of causal factors is badly needed if the goal of analysis is to move towards optimal allocation of resources among controllable variables (pp. 1158-1159).

Lee, Kwak and Han (1995) propose an Analytic Hierarchical Model with four to seven levels of performance measurement consideration. The operational level (lowest level) uses quality, cycle time, delivery, cost, inventory turnover, asset turnover and other similar performance measures. The middle level uses market share, customer satisfaction productivity, ROI, and profitability measures. The top level (executive) uses financial and nonfinancial performance measures. The hierarchy can be adjusted as the company or environment changes.

Kaplan and Norton (1996) summarize the "contemporary" issues facing organizations, noting that product life cycles continue to shrink and changing technological platforms assure that competitive advantage in one generation of a product's life is no guarantee of product leadership in the next (p. 5). They state that the financial-reporting process continues to be based on traditional accounting while the organization is trying to forge linkages and strategic alliances with external parties (pp. 6-7), and the financial accounting model needs to be "…expanded to incorporate the valuation of a company's intangible and intellectual assets, such as high-quality products and services, motivated and skilled employees responsive and predictable internal processes, and satisfied and loyal customers" (p. 7). They further note that financial measures have a short-term view and are based on past events, which has traditionally been sufficient since investments in long-term capabilities and customer relationships are not critical for success. The Balanced Scorecard proposed by Kaplan and Norton is intended to articulate the theory of the business and "...should be based on a series of cause-and-effect relationships derived from the strategy, including estimates of the response times and magnitudes of the linkages among the scorecard measures" (p. 17). "A good Balanced Scorecard should have an appropriate mix of outcomes (lagging indicators) and performance drivers (leading indicators) of the business unit's strategy" (p. 32).

Ittner and Larcker (1998) examine three measurement trends: 1) economic value measures, 2) nonfinancial performance measures and the balanced scorecard, and 3) performance measurement initiatives in government agencies. They state most economic theories support the contention that "…performance measurement and reward systems should incorporate any financial or nonfinancial measure that provides incremental information on managerial effort (subject to its cost)" (p. 206) while at the same time commenting on the insufficiency of current measurement systems: a 1996 survey by the Institute of Management Accounting found that only 15% of the respondents' measurement systems supported top managements' business objectives well while 43% were less than adequate or poor (p. 205). It would seem that either additional measurement systems are needed, or measurement system targeting needs adjustment.

Otley (1999) considers a framework structured around 5 issues: 1) objectives, 2) strategies and plans for their attainment, 3) target-setting, 4) incentive and reward structures, and 5) feedback loops. These five issues are tested against three major organizational control systems: budgeting, economic value added, and balanced scorecard. Otley's conclusion is that "…management accounting and other performance measurement practices need to be evaluated not just from an economic perspective, but from a social, behavioral and managerial perspective, within an overall organizational context" (p. 381).

Much has been written about performance measurement relative to different subsystems within the firm. Contemporary techniques have been described that include a variety of financial and nonfinancial measures (H_2) as well as balanced scorecard (H_4) systems.

Agency Based Theory

As noted in the history of traditional cost accounting, by the mid-1850s "The agency problems inherent with absentee ownership were just beginning to emerge (Heier, 2000, p. 218). Agency theory has been well studied and is important because it attempts to find ways to improve employee performance and thereby improve organization performance.

> Agency theory deals with the problems of creating a contract governing an exchange between individuals who have divergent interest. In the employment relationship, the basic agency problem is characterized in terms of structuring monitoring and compensation systems so that they will induce self-interested, utility-maximizing, risk-and-effort-averse agents (managers who want to maximize their compensation and minimize their effort expenditures) to act on the behalf of principals—or owners—who want to increase the value and performance of their firms (Bloom & Milkovich, 1998, p. 283).

Agency theory assumes "…that both parties are (1) rational and (2) self-interested, and that the agent is (3) both effort- and risk-averse" (Bloom & Milkovich, 1984, p. 284). Bloom and Milkovich find that higher-risk firms that rely on incentive pay exhibit poorer performance than higher-risk firms that do not emphasize incentive pay, adding evidence to the findings by Pearce, Stevenson and Perry (1985) who find that merit pay does not improve organizational performance. Contrary to the findings of Bloom and Milkovich (1984), and Pearce, et al. (1985), Banker, Potter and Srinivasan (2000) find that both nonfinancial and financial performance improves following the implementation of an incentive plan that includes nonfinancial performance measures.

Feltham and Xie (1994) look at economic trade-offs in multiple performance measure systems, specifically noting, "…performance measures frequently are incomplete or imperfect representations of the economic consequences of the manager's actions" (p. 429). The noisiness of the measure, due to uncontrollable events, and the congruence of the measure are considered, as is the value of additional performance measures to reduce risks and non-congruity. Chenhall (1997) finds stronger performance when manufacturing performance measures are used as part of managerial evaluation (p. 200).

Abernethy and Brownell (1997) show that where task uncertainty is highest (well established techniques for performing tasks is low) and number of exceptions (degree of variety in the tasks) is high, reliance on personnel forms of control has a positive effect on performance.

Datar, Kulp and Lambert (2001) review multi-dimensional compensation contracts and performance weighting systems. They find that "…the weight assigned to a performance measure is not simply a function of its own 'congruence' with the outcome, but also on how it interacts with the other variables in the contract" (p. 88). Bushman, Indjejikian and Smith (1995) use an agency model to show that the use of aggregate performance measures relative to more localized performance measures is an increasing function of intrafirm interdependencies.

Ittner, Larcker and Meyer (2003) in a review of subjectivity and the weighting of performance measures in a Balanced Scorecard relative to compensation systems find that:

> …subjectivity in the scorecard plan allowed superiors to reduce the "balance" in bonus awards by placing most of the weight on financial measures, to incorporate factors other than the scorecard measures in performance evaluations, to change evaluation criteria from quarter to quarter, to ignore measures that were predictive of future financial performance, and to weight measures that were not predictive of desired results (p. 725).

The conclusion of their study is "…that greater weight will be placed on quantitative measures than on qualitative measures, and that greater weight will be placed on measures that are based on aggregations of multiple indicators and performance relative to targets than on other measures" (Ittner, Larker & Meyer, 2003, p. 732). The findings of Ittner, Larker and Meyer are duplicated by Moers (2005) who states "Performance measure diversity leads to more lenient performance ratings and less differentiation among employees… subjectivity leads to bias in performance evaluation…if more subjectivity is used in evaluating and rewarding employees, superiors give higher performance ratings and compress these ratings (p. 79). Baker, Gibbons and Murphy (1994) review explicit and implicit contracts and find in some circumstances objective and subjective measures are complements, but objective weights that do not distort incentives will always be preferred to subjective weights.

Said, HassabElnaby and Wier (2003) examine the implications of nonfinancial performance measures included in compensation contracts on current and future performance. They note that contextual factors, environmental factors, and strategic plans vary across firms and, in turn, adopting appropriate nonfinancial measures determines the performance consequences of such measures. They conclude that firms that use a combination of financial and nonfinancial performance measures have higher returns on assets and higher levels of market returns (p. 193).

Ramachandran (2004) finds that the usefulness of accounting measures in compensation contracts is "…dependent on how accurately they provide information about the underlying managerial actions and to what extent their informativeness is clouded by the discretion managers have in reporting accounting numbers" (p. 61).

Chow and Van Der Stede (2006) conclude that financial, quantitative nonfinancial and subjective measurements each have their own strengths and weakness. Each has different impacts on employee actions like risk taking, innovation, emphasis on long- and short-term view, and tendency to game the performance evaluation system. Nonfinancial measures encourage risk taking and innovation and limit gamesmanship. There is no significant difference between financial and nonfinancial measurements in contributing to operational and strategic decision-making or ability to align intra and interdepartmental objectives.

> Information economics and agency theory research offers the potential for a rigorous, analytic theory of management accounting, rooted in the utility and profit-maximizing behavior of neo-classical economics, as well as in the more recent analytical tools of statistical decision theory and noncooperative multiperson game theory (Kaplan, 1984a, p. 404).

Agency theory addresses the human subcomponent of the firm system in an attempt to improve organization performance, is a component of balanced scorecards (H_4), and includes financial and nonfinancial measurements (H_2).

Contingency Based Theory

Contingency based theory is important because specific measures will have different impacts on organizational performance depending on the conditions under which they are applied, and contingency theory attempts to define which measurements are best under which conditions.

> The term contingency means that something is true only under specified conditions. As such there is no ‘contingency theory,’ rather a variety of theories may be used to explain and predict the conditions under which particular MCS

> [Management Control Systems] will be found or where they will be associated with enhanced performance (Chenhall, 2003, p. 157).

Chenhall (2003) reviews contingency-based research relative to Management Control Systems (MCS) and the way it has evolved to address the contemporary environment with Just in Time, Total Quality Management and Flexible Manufacturing as dimensions of context (p. 141), noting that contextual variables include the "…external environment, technology (traditional and contemporary), organizational structure, size, strategy and national culture" (p. 128).

According to Chenhall (2003), Agency Theory from economics attempts to maximize the benefit to the principal (employer) with incentive schemes to get commitment from the agents (employees) who are "…assumed to be self-serving and opportunistic" (p. 157) to achieve goals defined by the principal. "Agency theories have been criticized for not considering the context in which principals and agents contract and for not investigating the trade-offs with other elements of control systems" (p. 157). Psychology has attempted to identify "…individual characteristics such as personality or cognitive style affect the way individuals react and respond to different aspects of MCS" (p. 158). Behavioral economics provides a descriptive base for economic research by looking at empirical evidence. Contingency-based research has been criticized for its reliance on "traditional, functionalist theories" without applying more "interpretive and critical views" (pp. 158-159). Alternative approaches, derived from sociological literature, have been used to provide an interpretive and critical focus. "A strength of ‘alternative’ approaches is that they show the potential conflict between individuals and groups and how MCS may be implicated in these struggles” (p. 159). Davis, Schoorman and Donaldson (1997) look at the differences between agent based [economic] and Stewardship [psychology and sociology] based theories of management. They advise “…assumptions made in agency theory about individualistic utility motivations resulting in principal-agent interest divergence may not hold for all managers” (p. 20), and conclude “Managers whose needs are based on growth, achievement, and self-actualization and who are intrinsically motivated may gain greater utility by accomplishing organizational rather than personal agendas” (p. 43).

Drazin and Van de Ven (1985) review the “fit” of different approaches to structural contingency theory stating, “The key concept in a contingent proposition is fit, and the definition of fit that is adopted is central to the development of the theory, to the collection of data, and to the statistical analysis of the proposition” (p. 515). The premise of the models reviewed is that “…context and structure must somehow fit together if the organization is to perform well” (p. 514). In this study, three approaches are studied:

- *Selection Approach* originally hypothesized that organizational context (environment, technology, or size) is related to structure (centralization, formalization, or complexity). More recently, “…natural selection and managerial selection perspectives have surfaced and provide some justification for viewing fit as a basic assumption underlying congruence propositions between organizational context and structure and process” (Drazin &Van de Ven, 1985, p.

516). This approach implies a relationship to performance since performance drives the "natural selection" process. This approach also "… takes into account macro- and micro- levels of the organization design" (Drazin &Van de Ven, 1985, pp. 516-517).

- *Interaction Approach* explains organizational performance from the interaction of organizational structure and context "…based on Ashby's (1956) concept of requisite variety, in which organizational adaptability is enhanced when the degree of complexity present in the environment is reflected in the structure of the organization" (Drazin &Van de Ven, 1985, p. 517).

- *Systems Approach* eliminates the constraint present in both Selection and Interaction approaches where single contextual and structural factor pairs are studied relative to performance. The systems approach promotes "…the understanding of context-structure performance relationships…by addressing simultaneously the many contingencies, structural alternatives, and performance criteria that must be considered holistically to understand organization design" (Drazin &Van de Ven, 1985, p. 519). The trade-offs that result from looking at single pairs of factors with conflicts is addressed in the systems approach by using a pattern analysis for the interactions of multiple contingencies and structural patterns with a view to internal consistency (Drazin &Van de Ven, 1985, pp 521-522).

Results from the Van Drazin and Van de Ven (1985) review find no empirical evidence to support the interaction approach, but does find support for the selection and systems approaches.

Chow, Shields and Chan (1991) look at the differences in Asian and Western manufacturing quality and consider whether these differences are due to "…firms' management controls, the national culture [collectivism vs. individualism] of their employees, or the interaction of these two factors" (pp. 209 – 210). They find that the "…results are consistent with cultural individualism and management controls having independent, but not interactive, effects on manufacturing performance" (p. 209).

Chenhall and Langfield-Smith (1998) examine how different combinations of management techniques and accounting practices affect organizational performance based on differing (low cost or differentiation) strategic priorities (p. 243). They find that different managerial mind sets underlying differentiation and low price strategies may influence preferences for particular management accounting practices and the variables may act in combination to provide synergies or complementarities to enhance organizational performance (p. 245).

Chapman (1997) looks at typical contingent variables such as technology, environment, and strategy and suggests they might be seen as measuring the level of complexity facing organizations, though uncertainty is the driver for the organization's information processing requirements. "Uncertainty is caused not only by the interaction of a number of external contextual factors, but critically also by factors such as the level of organizational knowledge and understanding of how these impact on internal processes" (p. 201).

Ittner and Larcker (1998) note that the link between nonfinancial measures such as customer satisfaction and subsequent accounting and stock market performance vary across industries. "Similarly, the use and performance consequences of these measures appear to be affected by organizational strategies and the structural and environmental factors confronting the organization" and a need for evidence on the "…contingency variables affecting the predictive ability, adoption and performance consequences of various nonfinancial measures and balanced scorecards" (p. 224).

Davila (2000) investigates the relationship between project uncertainty, product strategy and management control systems in the Research and Design environment finding that cost and design information improve performance while time information decreases performance.

Amir and Lev (1996) find that financial information is largely irrelevant in fast changing technology based industries, while Davila (2000) notes "Current emphasis on first mover advantages, fast product introductions, more demanding product functionality, and shortening life cycles has put greater pressure on new product development" (p. 383). Evidence is found that project managers rely on nonfinancial measures much more than they do on financial ones due to an "…implicit assumption that good performance in nonfinancials will drive good financial performance (p. 404). The study provides evidence supporting a contingency theory of management control systems with alignment between the design and use of these systems and product strategy significantly related to performance (p. 404).

Bouwens and Abernethy (2000) look at the management accounting system design for firms that pursue customization as a strategic priority finding that customization affects the management accounting system by interdependencies rather than directly.

Lillis (2002) finds combined emphasis on manufacturing efficiency and customer responsiveness is “problematic”, while joint emphasis on quality and efficiency is relatively easily managed.

Moores and Yuen (2001) look at management accounting systems relative to life-cycles, finding that “…changes in an organization follow a predictable pattern across discrete stages of development over time…” (p. 353).

“Research is just starting to be published identifying contingencies surrounding the design and implementation of ABC/ABM [Activity Based Costing / Activity Based Management]…[and] there is very little published contingency work on balanced scorecards, target costing, life cycle costing, the broad array of nonfinancial performance indicators including those related to human resource management initiatives” (Chenhall, 2003, p. 130).

Contingency theory assumes that performance measurement optimization will be dependent on the circumstances under which the system is applied. Clockspeed is one contingency considered (H_3), and the impact of financial and nonfinancial measures under different contingencies have been reviewed (H_2),

Activity Based Costing and Economic Value Added Measures

The traditional and contemporary contingency-based strategies noted above are supplemented by more targeted financial measurement systems. In addition to traditional financial "costing" systems, Activity Based Costing (ABC) and Economic Value Added (EVA) financial measurement systems are also proposed. These two measures are important to note since they are widely utilized and are attempts to improve the value of financial measurement systems.

As noted by Thyssen, Israelsen, & Jorgensen (2006), the ABC accounting methodology introduced by Kaplan (1983, 1984a, 1984b) evolved from traditional cost accounting to provide better performance measurement in the contemporary environment. Kaplan (1983) notes that cultural and environmental differences have been considered to be responsible for the superior manufacturing performance of Japanese firms (p. 687), but argues that "Traditional cost accounting systems based on an assumption of long production runs of a standard product, with unchanging characteristics and specifications…[are]...not relevant in this new [contemporary] environment" (pp. 688-

689). Kaplan further advises that accountants need to develop measurements to address quality, inventory, productivity, and new product technologies in the "new" environment. Use of external reporting systems for internal reporting and evaluation systems result in distortions of economic performance (Kaplan, 1984b, p. 99). Cooper and Kaplan (1988) proposed activity-based costing as an alternative to typical cost accounting systems to reduce distortions in the cost data. The theory is that all of a company's activities that support production and delivery should be considered product costs, and should be split apart and traced to individual products or product families (pp. 96-97). Cooper and Kaplan (1991) advise that to use ABC effectively "…requires a conceptual break from traditional cost accounting systems…"(p. 130). They further highlight the advantage of the ABC analysis in its ability to view the business in different ways, "…by product or group of similar products, by individual customer or client group, or by distribution channel…." (p. 131). One main advantage to an ABC analysis is the information allowing reduction of resource consumption (p. 135). The implementation and uses of ABC continue to be described and studied (Roztocki, 2001b; Roztocki, 2001c; Roztocki, 2003; Roztocki, & Schultz, 2003; Roztocki, Valenzuela, Porter, Monk, & Needy, 1999; Roztocki, & Weistroffer, 2004a; Roztocki, & Weistroffer, 2004b; Roztocki, & Weistroffer, 2005; Thyssen, Israelsen, & Jorgensen, 2006). Anderson and Young, (1999) commenting on (Chenhall & Langfield-Smith, 1998) state that "…recent empirical evidence supports the view that ABC effectiveness depends on organizational and technical factors" and that "…what defines an effective ABC system: whether ABC data are used in product cost reduction or process improvement; and, whether ABC data are more accurate than data from traditional cost system" (p. 526). They find that the outcome of ABC implementation is influenced by the contextual setting (p. 555).

The EVA concept trademarked by Stewart (1991) has its proponents (Keen, 1997; Roztocki, & Needy, 1999b) due to its more accurate representation of "actual costs". Ittner and Larcker (1998) recognize that "…traditional accounting measures such as earnings per share and return on investment are the most common performance measures…" but "…they have been criticized for not taking into consideration the cost of capital and for being unduly influenced by external reporting rules (p. 209). These weaknesses are being addressed by economic value measures, founded on residual income and internal rate of return concepts (p. 209). Further works cite the advantages of a combined ABC-EVA implementation (Roztocki, 2000a; Roztocki, 2000b; Roztocki, 2000c; Roztocki, 2001a; Roztocki, 2001d; Roztocki, & Needy, 1998; Roztocki, & Needy, 1999a; Roztocki, & Needy, 1999c; Roztocki, & Needy, 2000). Though there are proponents of EVA, Biddle, Bowen and Wallace (1997) find:

> There is little evidence to support the Stern Stewart claim that EVA is superior to earnings in its association with stock returns or firm values. In no case does EVA significantly outperform EBEI [earnings before extraordinary items – note that earnings is not a cash flow] in tests of relative information content. On the contrary, in most cases the evidences suggest that earnings outperforms EVA" (pp. 331-332).

The claim is made that both ABC and EVA positively impact the quality of financial information usefulness and improve firm performance. This may have an impact on the relative value of financial and nonfinancial measures (H_2).

Benchmarking and Key Performance Indicators

Benchmarking and Key Performance Indicators (KPI) are important concepts to review since the performance measures utilized help organizations choose best practices to improve their performance.

El-Mashaleh, Minching and O'Brien (2007) propose benchmarking using DEA (data envelope analysis) to foster trade-off analyses among various performance metrics. They state, "…a firm's cost performance may improve, but schedule performance declines. How can one determine whether this trade-off is truly desirable? Is the overall performance of the firm better…" (p. 12)? These questions are addressed by DEA which uses mathematical linear programming to form an envelopment surface (efficient frontier) with

> …three inherent powerful features. First, it has the ability to incorporate multiple inputs and multiple outputs—particularly when it is used in conjunction with linear programming. Linear programming can handle large numbers of variables and relations (constraints). Second, DEA has no a priori assumptions. There is no need to assign weights to the different inputs and outputs. The weights are derived directly from the data, freeing the user from arbitrary, subjective weightings. Third, the measurement units of the different inputs and outputs need not be congruent. Some may involve the number of persons, areas of floor space, money expended, etc. The various scaling adjustments required for graphical purposes do not affect the relationships among the variables themselves…. (p. 14).

Haponova, Al-Jibouri and Reymen (2006) look for KPI in benchmarking. They note "Many of the indicators are also focused on product and not on the process. There are few existing indicators that inform stakeholders about how well their process is going during the various stages" (p. 1). Moor and Smits (2002) review KPI in a "Community of Practice". Different methods they look at include:

- *Human Resources Accounting* (HRA) Method which measures the added value of the members of an organization by aggregating salary expenses (p. 20).

- *EVA* Method which calculates the net revenues minus operational expenses, taxes, and interest (p. 20).

- *BSC* Method which is a management tool that aligns measures with key strategies, tracks progress, and assigns accountability (p. 20).

- *Intellectual Capital* (IC) Method which monitors the intangible resources in an organization. The IC method first distinguishes between Financial Capital (monetary resources) and Intellectual Capital (intangible resources) which is further subdivided into Human Capital (intangible resources possessed by individuals) and Structural Capital (intangible resources available to the organization). The IC approach takes the strategy of the

> organization as the basis. Finally, relevant categories, critical success factors and related indicators of IC are identified and later aggregated (p. 21).

The performance measures utilized for benchmarking and KPI relate to all hypotheses under consideration in this present study.

<u>Financial, Nonfinancial Objective - Subjective Measures: Balanced Scorecards</u>

Financial, nonfinancial objective, nonfinancial subjective (H_2) and balanced scorecards (H_4) have been mentioned in previous sections of this chapter. There are, however, additional studies and concepts relating to these measures that do not easily fit into the prior categories and are worth mentioning here.

"… measures, such as product innovation, product leadership, employee skills and morale, or customer loyalty, may be much better indicators of future profitability than annual profits" (Kaplan, 1984a, p. 413). According to Abernethy and Brownell (1997) "Considerable attention is now being directed towards understanding the role of accounting controls in other settings where the characteristics of the tasks undertaken bring into question the suitability of conventional, accounting-based controls and raise the prospect that for effective control, organizations will need to design their control systems around a variety of non-accounting controls" (p. 233). Abernethy and Lillis (1995) find that "The use of efficiency-based performance measures in manufacturing declines as a firm's commitments to flexibility increases" (p. 249). Perera, Harrison and

Poole (1997) provide empirical evidence to support that of Abernethy and Lillis (1991) when they note that "…changes in manufacturing strategies to emphasize quality, flexibility, dependability and low cost should be accompanied by changes in formal performance measurement systems to place greater emphasis on nonfinancial (operations-based) measures" (p. 569). They also provide empirical evidence of the increased use of nonfinancial performance measures by firms pursuing a customer-focused manufacturing strategy (pp. 568 - 569).

The BSC proposed by Kaplan and Norton (1996) is intended to articulate the theory of the business and "...should be based on a series of cause-and-effect relationships derived from the strategy, including estimates of the response times and magnitudes of the linkages among the scorecard measures" (p. 17). "A good Balanced Scorecard should have an appropriate mix of outcomes (lagging indicators) and performance drivers (leading indicators) of the business unit's strategy" (p. 32). Neely et al. (1997) presents a framework with 22 recommendations for designing and auditing BSC performance measures. In this framework, subjective measures are not included as confirmed in Item 22 "Performance measures should be objective – not based on opinion" (p. 1137). Neely et al. (2000) point out that though the process of designing a measurement system is valuable to managers, the key to a successful measurement system is implementation. "The real challenges for managers come once they have developed their robust measurement system, for then they must implement the measures. As soon as they seek to do so they encounter fear, politics and subversion" (p. 1142). Even successfully implemented systems tend to become overly complex with new measures added while obsolete measures are retained. “Hence the importance of research into these four interlinked themes of measurement system design, implementation, use and ongoing management, and the people, processes, infrastructure and culture issues associated with them” (p. 1142).

Nagar and Rajan, (2001) find that

> …both financial quality measures, such as external product failure costs, and nonfinancial quality measures, such as defect rates and on-time deliveries, are significantly associated with future sales. One potential reason that both sets of measures are leading sales indicators is that external failure costs are customer-initiated measures, while defect rates and on-time deliveries are firm-initiated. These results imply that a collection of financial and nonfinancial quality measures best captures the effect of quality on future revenues” (p. 512).

Van der Stede, Chow and Lin (2006) examine the distinction between objective and subjective performance measures stating that “Prior empirical research has typically only differentiated between financial and nonfinancial performance measures” (p. 186). They find that performance measurement diversity is beneficial, though combining quality-based strategies with extensive use of objective nonfinancial measures is not associated with higher performance (p. 186).

Performance Measurement Review Conclusions

Performance measurement is intended to help organizations improve their performance, includes a number of different tools that exhibit varying degrees of success under different contingencies, and can be viewed from a variety of different perspectives. This concludes the review of literature relating to performance measurement. The following two sections review clockspeed and systems literature since they are integral concepts in this study.

Clockspeed

Clockspeed (H_3) is important because it is a dominant factor in our rapidly changing global marketplace. Fine (1998) introduces the concept of organizational clockspeed by analogy. Organizations in fast clockspeed industries are compared to fruit flies and organizations in slower clockspeed industries to less rapidly evolving species. “Clockspeeds are to business genetics what lifecycles are to human genetics” (p. 17). In Fine’s view, organizations must evolve to meet new challenges or die, just as species evolve for survival, and companies in low clockspeed industries can benefit from studying companies in high clockspeed industries (the fruit flies of industry).

An industry’s clockspeed is increased with increases in technological innovation and competitive intensity. Of considerable importance are the advances of semiconductor and fiber optics technologies since these advances have contributed to increases in clockspeed of almost all industries (p. 26). With our global economy, every innovation in information and communication industries affects all industries worldwide simultaneously.

Two "laws of supply chain dynamics" are identified by Fine (1998):

- *Volatility amplification*, where in the supply chain "…volatility of demand and inventories in the supply chain tend to be amplified as one looks farther 'upstream' – that is away from the end user" (p. 89). This effect is described by Forrester (1958), demonstrated in the beer game by Sterman (1989), and is sometimes called the bullwhip effect.

- *Clockspeed amplification*, where clockspeeds tend to be amplified as one looks farther downstream toward the final customer (p. 97).

These two laws of supply chain dynamics are important due to the hierarchical and interdependent systems structure of the supply chain. Each hierarchical level of the supply chain adds more amplification in both volatility and clockspeed (p. 101).

Guimaraes, Cook and Natarajan (2002) study the relationship of industry clockspeed to supplier network performance and the use of information technology, finding that increased information technology effectiveness improves supplier network performance in high clockspeed industries, but high clockspeed has a detrimental effect on supplier network performance where deeper relationships with few suppliers are used. Organizations in high clockspeed industries may need to develop "shallow" relationships with a relatively large number of suppliers.

Carillo (2005) identifies several characteristics of fast clockpeed industries (p. 139):

- High or increasing marginal net revenue earned per unit
- Low discount rates
- Low development cost structures
- High and / or growing total market of potential buers
- Technological and organizational barriers

Characteristics of low clockspeed industries include:

- Low initial marginal net revenue earned per unit
- High development cost structures
- Low and /or shrinking total market of potential buyers

Three “submetrics” of clockspeed are considered by Fine (1998): process clockspeed, product clockspeed, and organizational clockspeed (p. 17). These submetrics are considered relative to a selection of sample industries as shown on Table 1:

TABLE 1

SAMPLE INDUSTRY CLOCKSPEEDS

Measuring Clockspeed – Sample Industries			
Industry	**Product Technology Clockspeed**	**Organization Clockspeed**	**Process Technology Clockspeed**
FAST-CLOCKSPEED INDUSTRIES			
Personal computers	< 6 months	2-4 years	2-4 years
Computer-aided software engineering	6 months	2-4 years	2-4 years
Toys and games	< 1 year	5-15 years	5-15 years
Athletic footwear	< 1 year	5-15 years	5-15 years
Semiconductors	1-2 years	2-3 years	3-10 years
Cosmetics	2-3 years	5-10 years	10-20 years
MEDIUM-CLOCKSPEED INDUSTRIES			
Bicycles	4-6 years	10-15 years	20-25 years
Automobiles	4-6 years	4-6 years	10-15 years
Computer operating systems	5-10 years	5-10 years	5-10 years
Agriculture	3-8 years	5-10 years	8-10 years
Fast food	3-8 years	25-50 years	5-25 years
Beer brewing	4-6 years	400 years	2-3 years
Airlines	5-7 years	25 years (hardware) 2-3 years (software)	< 5 years
Machine tools	6-10 years	6-10 years	10-15 years
Pharmaceuticals	7-15 years	10-20 years	5-10 years
SLOW-CLOCKSPEED INDUSTRIES			
Aircraft (commercial)	10-20 years	5-30 years	20-30 years
Tobacco	1-2 years	20-30 years	20-30 years
Steel	20-40 years	10-20 years	50-100 years
Aircraft (military)	20-30 years	5-30 years	2-3 years
Shipbuilding	25-35 years	5-30 years	10-30 years
Petrochemicals	10-20 years	20-40 years	20-40 years
Paper	10-20 years	20-40 years	20-40 years
Electricity	100 years	25-50 years	50-75 years
Diamond mining	Centuries	20-30 years	50-100 years
(Fine, 1998, p. 239)			

Mendelson and Pillai (1999) look at industry clockspeed relative to measurements and operational implications and find that industry clockspeed is related to internal operations and organizational clockspeed, "…the frequency with which a firm redesigns its products, the duration of its development projects, the speed at which its manufacturing operations are stabilized, and the likelihood of organizational restructuring, all correlate very strongly with the clockspeed of its industry environment" (p. 2). In Mendelson and Pillai's study, three components are used to measure clockspeed:

- The fraction of total revenue derived from new products (i.e., introduced within the preceding twelve months)—an indicator of product innovation;
- The total duration of the product life cycle (i.e., product life); and
- The rate of decline in the prices of input materials (p. 3).

Carillo (2005) looks at new product development clockspeed (using average rate of new product introduction for a particular industry). Similar to Mendelson and Pallai's findings, Carillo notes that by focusing "…on the new product development dimension of clockspeed…[they] also capture the impact of process and organization dimensions on the firm's ability to bring new products to market effectively" (p. 126), though more work is needed to develop "…appropriate measures and managerial guidance for the process and organization dimensions of clockspeed" (p. 139).

Systems Definitions and Concepts

A system as defined by Lendaris (1986) is: "a) a unit with certain attributes perceived relative to its (external) environment, and, b) that unit has the quality that it internally contains subunits, and these subunits operate together to manifest the perceived attributes of the unit" (p. 604). A system is a subsystem of supra (meta) systems, and is also a supra (meta) system of other systems (subsystems). In other words, the Level A system is the Level B subunit of other systems, and the Level B subunit is the Level A system of other Level B subsystems. The boundaries of a system are established by definition (selecting the "perceived attributes" and subunits which operate together to manifest the emergent properties of those perceived attributes). In the case of economics, Simon (1981) describes this hierarchical level relative to man, markets and economy:

> Among all the social sciences, economics exhibits in purest form the artificial component in human behavior and does so at three or more levels" the level of the individual actor (economic man or business firm), the level of markets, and the level of an entire economy. At all these levels the outer environment is defined by available technologies and by the behavior of other economic actors, other markets, or other economies. The inner environment is defined by the system's goals and by its capabilities for rational, adaptive behavior" (p. 31).

Another basic characteristic of systems is circularity as opposed to linearity. Systems are composed of loops and delays. Senge (1990) deals with this concept in great detail with his description of basic archetypes noting the effects of feedback. An example of a simple feedback loop he uses is the process of filling a glass with water. One starts with an actual level of water that is less than the desired level of water in the glass. Since the actual level (reality) is less than the desired level, the action is to turn on the faucet. As the glass fills up, the reality level more and more closely approximates the desired level, followed by the action of turning the faucet thus reducing the flow. This is a repeating looped cycle (process) which repeats until the actual level (reality) equals the desired level and the faucet is turned off. A similar system, with the addition of a delay, is the process of adjusting the temperature of water for a shower. The longer the delay between turning the faucet and the adjusted temperature (feedback), the more difficult it is to achieve desired temperature (more iterations are required). Taking the delay into account and waiting until feedback is received before taking modifying action (turning the faucet) can speed up this process by reducing the number of iterations required.

Based on an understanding of feedback loops and delays, a number of archetypes with varying degrees of complexity have been identified by Senge (1990) that explain common problems that are faced on a regular basis. The archetypes offer leverage because they restructure the information to show the structural simplicity underlying the complexity of the problem. Non-leverage actions are frequently used (symptomatic solutions), but they do not address the fundamental problem, resulting in recurrence of the problem and the need to apply the symptomatic solution again. When the fundamental problem and solution are identified by the archetype, the problem can be addressed in a way that eliminates the recurring pattern.

All organizations are subsystems of a larger system, the supply chain, which Fine (1998) proposes to view as "…consisting of three strands: a chain of organizations, a chain of technologies, and a chain of capabilities" (p. 13), and the organization's core capabilities must therefore be assessed in context of capability chains. In an organizational setting, the organization is the Level A system and individuals (employees/agents) are the Level B units of the system. According to Senge (1990), leverage for functionality of the organizational system is available through recognition of growth of the individual units and their interactions. Growth of the individual units is achieved by pursuit of Personal Mastery (PM). PM requires an awareness of deeply held beliefs (mental models) that may limit the ability to create what is desired. Reflection skills help increase awareness of mental models and recognition of leaps of abstraction (a core element of misunderstanding). To reflect and recognize leaps of abstraction beliefs about the way the world works, about the nature of business, about people in general and about specific individuals must be questioned. Once generalizations are recognized, determination of what data the generalization is based on and a decision of whether the generalization may be inaccurate or misleading must be made. PM also requires a commitment to principles and values, utilization of the rational mind and the intuitive mind, an awareness of oneself as an individual, an awareness of ones place within the organization, and an awareness of ones place within the world at large. Finally, PM requires creative tension (the gap between desire and reality) to promote progress toward goals or visions which are driven by purpose, thereby maintaining cycles of growth.

Leverage in the organization through interactions of the units is found in developing shared vision (purpose) and alignment of personal visions with organizational visions (team learning) which maximizes the utilization of energy. The concept of archetypes noted above apply to the relationships of Level B units within the organizational Level A system, and can be used to help promote the shared vision and alignment that are desired.

Given knowledge of the impact of mental models on the individual and the organization, it is advisable to view problems from multiple perspectives when reviewing problem resolution from the past or attempting to anticipate and prevent problems in the future. Multiple perspectives are identified and defined by Linstone (1999) as follows:

- *Technological Perspective:* The United States as a culture is the most strongly technologically oriented culture in the world. This orientation is pervasive to the point that we rate beauty, quality of life and other aesthetic qualities in quantitative terms. The advent of the computer as a tool for analysis, and its utility in the technological orientation, has strengthened the technological perspective as the decision-making perspective of choice.

- *Organizational Perspective:* The organizational perspective reflects the culture and myths of the organization and helps bind the organization into a distinct entity in the eyes of the members. This perspective is of crucial importance for the perception of reality and is intimately bound to the need for security (belonging). The organizational perspective is related to power, and as such is an important perspective to utilize in attempting to affect change in the social environment. History is replete with examples of this perspective being used to promote destruction. Where is the real leverage? How can conflicts among units be turned to constructive use? It has been documented that group opinion can modify or distort individual judgment. This can be used to affect desired change, but should also serve as a warning to beware.

- *Personal Perspective:* Communication of complex problems and issues may be made more effective by means of the personal perspective. Six million murders in the holocaust vs. *Diary of Anne Frank* impacts perception at a level not possible by the analytic mind. One "real" death versus statistics highlights the personal perspective grasp of reality not possible with statistics alone. In the organizational environment, effective organizations are those that have found successful ways of making the self-interest of the members work constructively and in unison to support the goals of the organization.

In addition to utilizing multiple perspectives, a variety of inquiring systems (IS) have been identified by Mitroff and Turoff (1973) that help understand the environment and the nature of the problem in question:

- *Leibnizian IS:* The epitome of formal, symbolic systems. Strives to reduce problems to a formal mathematical or symbolic representation. Most appropriate for working on clearly definable, well-structured problems for which there exists an analytic formulation and solution. Theoretically, deductively derived models. Emphasizes theory to the detriment of data.

- *Lockean IS:* The epitome of experimental, consensual systems. Emphasizes empirical, inductive representations of problems. Best suited for working on well-structured problem situations for which there exists a strong consensual position on the nature of the problem situation. Empirically, inductively derived models emphasize data to the detriment of theory.

- *Kantian IS:* The epitome of multimodal synthetic systems. On any problem will build at least two alternate representations or models (if complementary is Kantian IS, if antithetical is Hegelian IS). Places emphasis on alternate models in dealing with problems to get as many perspectives on the nature of the problem as possible. Best suited to problems which are inherently ill-structured and inherently difficult to formulate in pure Leibnizian or Lockean terms.

- *Hegelian IS:* The epitome of conflicting, synthetic systems. Emphasizes creation of at least two, completely antithetical, representations. May start with two strongly opposing Leibnizian models of a problem. Premise is that data are not information, information is that which results from the interpretation of data and out of a dialectic confrontation between opposing interpretations, the underlying assumptions of the opposing Leibnizian models will be brought to the surface for conscious examination.

- *Singerian IS:* The epitome of synthetic multimodal, interdisciplinary systems (meta-IS). Theoretical unification of previous paradigms includes all the previous IS as sub models in the design. Offers a theory about how to manage the application of the other types of IS. Speaks almost exclusively in the language of commands. Attempts to draw hidden commands out of every system so that the analyst is better able to choose the commands he wishes to postulate. Shows how it is possible to incorporate ethics into the design of any given system. If a command underlies every system, it can be shown that behind every system is a set of ethical presuppositions.

Systems have been defined and various aspects of systems have been identified. A Systems Methodology also exists and is articulated by Hall (1989). The function of systems methodology is to create efficient open systems or entities which satisfy one or more goals. The methodology focuses on systems as wholes, and on their parts taken separately only as they relate to properties of the whole. Systems Methodology is distinct from the formal sciences and the factual sciences due to the use of value truths in addition to formal truths (which do not depend on meanings, but only relationships), and factual truths (which depend on the truth of its components). Value truths are subjective and nontransferable, and are used to define wanted systems. Value system design is found in every phase of systems methodology, and it employs a complete subcycle of metasystem synthesis, metasystem analysis and metasystem optimization. The value system design concludes with specific tentative metasystem, that provides the logical basis for the concrete system design.

If Systems Methodology is considered to be the Level A system, the Level B elements in the logic of systems methodology are as follows:

- *Problem definition,* including environmental forecasting and impact assessment, in principle must be done over the entire system life cycle. Essential activities include isolating, quantifying, and clarifying the need which creates the problem, and describing the set of environmental factors that define the system and its environment. Describes the operational situation, user requirements, legal considerations, and possible system inputs and outputs.

- *Value system design*, or metasystem design, or normative scenario production, means to select the set of objectives and goals that will: 1) guide the search for alternatives, 2) imply the types of analyses required of the alternatives, and 3) provide the multidimensional decision criterion for selecting the most appropriate ("optimum") system.

- *Systems synthesis*, or collecting, searching for, or inventing a set of ideas, alternatives, or options. Each alternative must be worked out in enough detail to permit its subsequent evaluation with respect to the objectives, and to permit an application of the multidimensional decision criterion to decide its relative merits for proceeding into the next phase.

- *Systems analysis* means determining the relevant consequences in terms of the value system. These deductions may relate to quality, market, reliability, cost, effectiveness, quality of life, freedom, privacy, etc.

- *"Optimization"* of the alternatives, or proportioning the system variables to meet the objectives, entails interaction of the first four steps, often by using a model for selected system attributes which may be useful in the proportioning.

- *Decision making* involves evaluating the consequences of the alternatives developed in systems analysis relative to the objectives, and incorporating these evaluations into the decision criterion so that all alternatives can be compared relative to the criterion, to the end that one or more alternatives can be selected for advancing to the next phase.

- *Planning for action* to implement the next phase includes communicating the results of the process to this point, scheduling subsequent efforts, allocating resources to carry out the work, assigning priorities for subsequent action, setting up a management control system consisting of performance criteria and feedback methods. If we were not modeling a multi-phase system, this step for starting and controlling action would be final.

Complexity is another systems concept that warrants review since as noted by Pagels (1988) "…the mind can hold at most 7 ± 2 distinct items before its attention" (p. 41). Pagels goes on to look at complexity from several different perspectives:

- *Algorithmic complexity* is the length of the minimal program required to compute something. This concept was described by Alan Turing who "…distinguished between ‘computable’ and ‘noncomputable’ numbers…” using the example of 3 divided by 7 (pp. 55-56). The complexity of the resultant number is high if one were to try to define each sequential digit, as in defining a number derived by successive random roles of a die [0.42857142…], but the program to derive the number 3/7 is quite short. Based on the concept of algorithmic complexity the appearance of complexity may, at its root, not be complex. “For ‘computable’ numbers, even if they are infinitely long, it is possible to write a relatively short program that will calculate them” (p. 56). Algorithmic complexity is “… a definition of randomness…” (p. 64).

- *Computational complexity* is a measure of the time it takes to solve a problem. Computational complexity exists in two general categories, those “…that require a geometrical (exponential) amount of computing time and those that require only an arithmetic (power law) amount of computer time” (p. 62). One classic problem of the geometrical type is the traveling salesman problem where the salesman has a certain number of cities to visit while traveling the shortest distance upon return to the start point. Problems of the geometrical type are suggested to require in their extreme “… millions of lifetimes of the universe to be solved… ”(p. 62). “Algorithmic complexity is in a sense a measure of complexity in space (the length of the minimal algorithm); computational complexity is a measure of complexity in time (the time it takes to solve a problem) as well as in space” (p. 61).

- *Information-based complexity* is based on the clarity of information. Is the problem completely specified and known or is the available information partial or contaminated. Information-based complexity is relevant to real world problems such as performance measures. Lack of clarity of information is referred to as "noisiness" of information by Feltham and Xie (1994) and the quality of information as "informativeness" by Ramachandran (2004).

- *Physical complexity* is based on the diversity of a system in a hierarchical manner. This hierarchy can correspond to the structural layout of the system or, to clustering the parts by the strength of interactions. "In particular, if the most strongly interactive components are grouped together and this procedure is repeated with the resulting clusters, one produces a tree [like an organization chart] reflecting the hierarchy of the system. Once such a hierarchy has been defined it is possible to assign a measure to its complexity, taking into account diversity in interactions among the components" (p. 65).

- *Logical depth* is defined by how hard it is to put something together starting from elementary pieces, "…measured by how long it takes to simulate the full development of that object beginning with the elementary algorithm and taking no short cuts" (p. 67).

According to Simon (1981) “Economics …illustrate[s] how outer and inner environment[s] interact, and in particular, how an intelligent system’s adjustment to its outer environment (its substantive rationality) is conditioned by its ability to discover appropriate adaptive behavior (its procedural rationality)” (p. 31). Rationality is the attempt to optimize the allocation of scarce resources. Operations research is an applied science that contributes to achievement of procedural rationality by providing “…algorithms for handling difficult multivariate decision problems, sometimes involving uncertainty” (p. 34). Algorithms utilized in operations research include linear programming, queuing theory, linear decision rules for inventory control and production smoothing. Modeling the real world introduces complexity into the business firm’s outer environment subsequently that increases the complexity of the inner environment. For the inner environment, constraints on adaptation include uncertainty about the outer environment and limits on the calculation capabilities available for solving the optimization problems. “The normative theory of the firm becomes a theory of estimation under uncertainty and a theory of computation—decidedly nontrivial theories[,] as the obscurities and complications of information and computation increase” (p. 34). This increase in complexity gives rise to “satisficing” decision. “… the decision that is optimal in the simplified model will seldom be optimal in the real world. The decision maker has a choice between optimal decisions for an imaginary simplified world or decisions that are “good enough,” that satisfice, for a world approximating the complex real one more closely” (p. 35).

> Normative economics has shown that exact solutions to the larger optimization problems of the real world are simply not within reach or sight. In the face of this complexity the real-world business firm turns to procedures that find good enough answers to questions whose best answers are unknowable. Thus normative microeconomics, by showing real-world optimization to be impossible, demonstrates that economic man is in fact a satisficer, a person who accepts "good enough" alternatives, not because he prefers less to more but because he has no choice" (Simon, 1981, p. 36).

<u>Conclusions</u>

Performance measures have a long history of use had have been studied from a variety of different perspectives. To summarize:

- Not much evidence has been found to determine under which conditions financial and nonfinancial measures perform best (Hemmer, 1986) (H_{2-3}).
- Synergistic relationships between different measures are assumed to exist (Capon, et al., 1990; Chenhall & Langfield-Smith, 1998) (H_{1-4}).
- Performance measurement systems are considered to be insufficient and do not support top managements' business objectives (Ittern & Larker, 1998) (H_{1-4}).
- Due to contingencies (including clockspeed – H_3), the complexity of (and interaction with) the larger economic metasystem, the complexity of the organization itself, and trade-offs and noisiness (informativeness) of

performance measures, managers rely on satisficing (Simon, 1981) rather than truly optimal decisions.

- There is a tendency to rely on the numbers generated by performance measures and not on the processes behind the numbers (H_1) (Johnson and Kaplan, 1987; Haponova, et al., 2006), highlighting the need to view performance measurement systems from a systems perspective [“…economic, social, behavioral, and managerial within an overall organizational context” (p. 381). (Otley, 1999)].

The next Chapter develops the theoretical basis for the questions and hypotheses under consideration using a systems perspective.

CHAPTER III

DESCRIPTION OF THE PROBLEM

Questions and Hypotheses

Can one quantify the value of “managing process” with a systems perspective? As complex dynamic systems, organizations are compared to living organisms (Fine, 1998; Johnson & Broms, 2000), a perspective that may be useful. Literature notes the value of nonfinancial measures (Chow & Van der Stede, 2006), and even a preference for managing by nonfinancial measures because financial measures are after-the-fact (Banker, Potter & Srinivasan, 2000; Lee, Kwak & Han, 1995; Nagar & Rajan, 2001), but using these measures does not fully address the issue. True, managing by nonfinancial measures gets one “closer” to the process, but this does not get to the heart of the process structure because it does not “quantify” the process structure or the “value added” components of the structure. Are there fundamental process related measures? Many companies identify Key Performance Indicators (KPI), but do these indicators truly represent “Key” processes driving profitability and success? The Balanced Scorecard proposed by Kaplan and Norton (1996) address the comprehensive nature of performance measurement requirements by including Financial, Customer, Internal Business Process, and Learning and Growth metrics.

Perhaps a different view of business process is needed. As Collins and Porras (1997) state "...we're asking you to see the success of visionary companies—at least in part—as coming from underlying processes and fundamental dynamics embedded in the organization…" (p. 41). A perspective of business process types that may address this issue is offered by Keen (1997). Keen's perspective includes four fundamental process types; 1) Identity, 2) Priority, 3) Background, and 4) Mandated. These four process types, defined as "process salience," are as follows:

- An *identity* process is one that defines the company for itself, its customers, and its investors. It differentiates a firm from its competitors and is at the heart of the firm's success (p. 25). For FedEx the identity is rapid, reliable delivery of packages.

- *Priority* processes are the engine of corporate effectiveness. They strongly influence how well identity processes are carried out and how a firm stands relative to its competition…Priority processes tend to be invisible to the customer…but when they fail the problems are visible and immediate…. In the case of FedEx, a package delivery company, airplane scheduling and maintenance would be priority processes. For McDonald's, food supply management is a priority process. Customers think of McDonald's as a family restaurant, not a food distributor. They will not give food-supply management a thought unless the process breaks down, and they discover they can't get fries with their Big Macs (p. 26).

- *Background* processes are a necessary support to daily operations. Many administrative and overhead functions are background processes. For most companies, office management, document management, accounting, and many other common administrative processes are background. They are often the core of daily operations, but it is a mistake to allow their visibility to make them the main target for management attention and capital investment, because improving them rarely generates much EVA [Economic Value Added] (p. 27).

- *Mandated* processes are those a company carries out only because it is legally required to do so. Regulatory reporting and filing tax returns are obvious examples (p. 27).

A fifth process type is also noted, folklore processes, which exist only because they were implemented in a previous time period but offer no functionality in the current environment. According to Keen, resources in general should be allocated to processes that will generate positive EVA (Economic Value Added) as defined by Stewart (1991):

> Economic value added (EVA) is the one measure that properly accounts for all the complex trade-offs involved in creating value. It is computed by taking the spread between the rate of return on capital *r* and the cost of capital *c** and then multiplying by the economic book value of the capital committed to the business:
>
> EVA = (r – c^*) x capital
> EVA = (rate of return – cost of capital) x capital (p. 136).

Stewart (1991) also notes that:

> …EVA increases when:

1. The rate of return earned on the existing base of capital improves; that is, more operating profits are generated without tying up any more funds in the business.
2. Additional capital is invested in projects that return more than the cost of obtaining the new capital.
3. Capital is liquidated from, or further investment is curtailed in, subsequent operations where inadequate returns are being earned. (p. 137)

Keen (1997) assesses processes using a "Salience Worth Matrix", where Salience is the above noted process type and Worth is defined as an asset if the process generates positive EVA and as a liability if the process generates negative EVA. Assuming that managers allocate more resources in the form of controls and performance measurement to the processes they deem more important than to those they deem less important, and also assuming that managerial decisions are based on these processes being monitored, it can be assumed that process measurement targeting correlate to management intervention and impact firm value accordingly, leading to the first hypothesis of the dissertation:

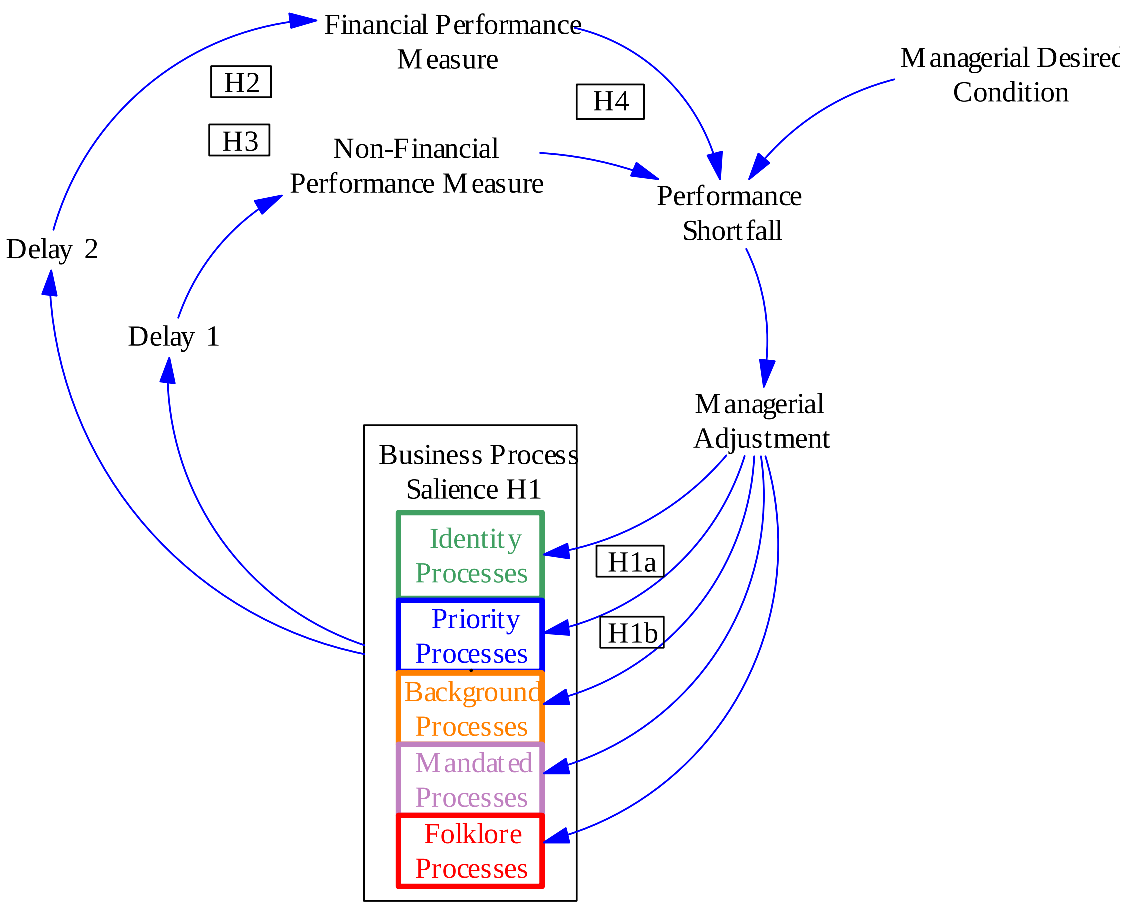
$H_{1\text{-}0}$: Salience of business processes identified for measurement do not correlate to firm value as tested by Kruskal-Wallis one-way ANOVA.

H_1: Salience of business processes identified for measurement correlate to firm value as tested by Kruskal-Wallis one-way ANOVA.

> $H_{1a\text{-}0}$: Identity business processes using the means results from H_1 do not have a higher positive correlation to firm value than Priority business processes as tested by the Chi-Square Contingency Test of Association.
>
> H_{1a}: Identity business processes using the means results from H_1 have a higher positive correlation to firm value than Priority business processes as tested by the Chi-Square Contingency Test of Association.
>
> $H_{1b\text{-}0}$: Priority business processes using the means results from H_1 do not have a higher positive correlation to firm value than Background business processes as tested by the Chi-Square Contingency Test of Association.

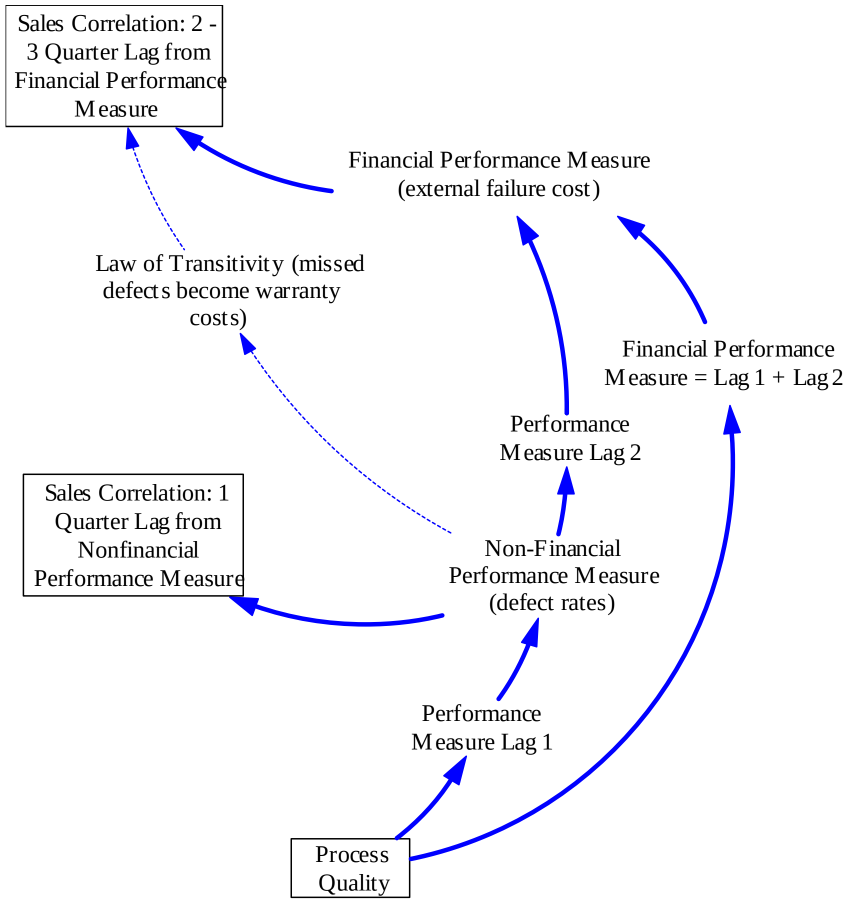
H_{1b}: Priority business processes using the means results from H_1 have a higher positive correlation to firm value than Background business processes as tested by the Chi-Square Contingency Test of Association.

Lee et al. (1995) note that one problem with accounting (financial) performance measures is that they are "…lagging indicators, [based on] historical statements of financial performance…the result of management performance, not the cause of it" (p. 344). In Figure 2 it would mean that Delay 2 > Delay 1.



<u>Figure 2:</u> Business Processes and Performance Measure Feedback

In a study by Nagar and Rajan (2001) financial measures are shown to be a leading indicator with correlation to sales 2 – 3 quarters in the future as compared to nonfinancial measures correlation to sales the following quarter (p. 496). They note that this financial "leading indicator" is not typical since financial measures are considered lagging indicators rather than leading indicators. Though the financial measure (external failure cost) in this case is a leading indicator, the law of transitivity applies and correlation between the nonfinancial measure (defect rates) and the 2-3 quarter lagged financial measured effect would exist since the effect measured by the nonfinancial measure is the root cause of the financially measured effect. Following this logic, the nonfinancial measure would correlate to both sales one quarter lagged, and to sales several quarters lagged, and be the fundamental measurement Figure 3).



<u>Figure 3:</u> Financial Measures vs. Nonfinancial Measures Lagged Effect

Nagar and Rajan (2001), in reference to another study by Luft and Shields note that in an experimental setting individuals can assess the future financial impact of quality more accurately using nonfinancial quality measures than using financial quality measures (p. 496). Banker, Potter and Srinivasan (2000) state that "…there have been very few studies on the relation[ship] between nonfinancial measures and financial performance, and the empirical evidence provided by these studies has been mixed…" (p. 66). An assumption can be made that the reduction of lagged effect of nonfinancial performance measures will result in earlier intervention and problem resolution, thereby positively impacting profitability and lead to the next hypothesis:

$H_{2\text{-}0}$: Non Nonfinancial performance measures are not more correlated to firm value than financial measures as tested by Kruskal-Wallis one-way ANOVA.

H_2: Nonfinancial performance measures are more correlated to firm value than financial measures as tested by Kruskal-Wallis one-way ANOVA.

Given that nonfinancial performance measures result in shorter lag periods of feedback than financial performance measures, the relative importance of the lag time will be heightened in higher clock-speed industries as defined by Fine (1998); with higher clock-speed industries being more susceptible to dynamic archetypes associated with delayed feedback (Senge,1990; Sterman, 2000), and thus leads to a third hypothesis:

$H_{3\text{-}0}$: The relative importance of nonfinancial performance measures compared to financial measures using the results from H_2 is not greater in high clock-speed industries than in low clock-speed industries as tested by Cramer's Phi.

H_3: The relative importance of nonfinancial performance measures compared to financial measures using the results from H_2 is greater in high clock-speed industries than in low clock-speed industries as tested by Cramer's Phi.

In an organizational setting, performance measures are the feedback mechanism used to pass information back to the controller (manager). According to Rubinstein (1975):

> Feedback control is a key to survival; it has endowed all living organisms with the system characteristics most productive for survival. The main feature in control with feedback is the flexibility which can be exercised by the controller to vary the input, leading to a change in output. The species [organization] with a high degree of specialization were [is] less likely to adapt to disturbances from the environment and, therefore, less likely to survive (p. 413).

This study is interested in information theory and dynamic system delays in organizational feedback systems since people perform poorly with delays in dynamic system feedback structures (Diehl & Sterman, 1995; Sterman, 2000, p. 26). Differing types of information (type of performance measure) have differing lag periods. The closer the information ties to the business process, the less the delay and the better people are able to work with the information. In Johnson and Brohms (2000) work, two examples are given of nonfinancial performance measures that are identified as largely contributing to the success of the organization. The first is the Takt time (rate at which vehicles are released to customers) used at a Toyota manufacturing facility to establish and maintain a continuous flow of product and information throughout the system (p. 88). This takt time is used to define the rate that each work-station completes its part of the process. Work orders are released from within the process in such a way that future components meet product process as they are needed. “Throughout the entire plant, the flow of information from both external and internal customers initiates and directs how material flows from worker to worker" (p. 83). The information flow is portrayed as "…a web of unbroken, interconnected relationships" (p. 38), with the further clarification that "The point to recognize…is that in a balanced continuous flow…the work is the information and all the information needed to direct operations is in the work"(p. 31). The second nonfinancial performance measure noted by Johnson and Broms (2000) is the density matrix of Scania, where the modularity benefit based on the engineered part is defined before the part is ever introduced into production, with no resultant delay in feedback relative to production. This measurement structure is engineered into the process. Bourne, Kennerley, and Franco-Santos (2005) study the use of non-standard measurements in high-performing business units as compared to medium-performing business units. Their research finds that high-performing branch managers use "simple mental models" to manage their business units on a daily basis. They often use their own metrics instead of the formal Balanced Scorecard that the organization uses (p. 382) and ignore inappropriate targets (p. 384). They proactively reduce the typical lag period found in average performing units that wait for weekly reports.

Can an analogy of Organization to Organism offer intuitive value in developing mental models that are simple and effective? Organisms evolve and develop effective means of adapting for survival. What feedback mechanisms in organisms can be effectively modeled in context of an organization to provide value? The Takt rate of Toyota is compared to the pulse rate of an organism, the modular structure of the Scania density index is compared to the cellular structure of organisms. Fine (1998) compares the clock-speed of industries to the life cycle of organisms, and the cyclic nature of "integrated product vertical industry" / "modular product horizontal industry" to the double helix DNA [this cyclic pattern is an oscillating system]. Brown, Hitchcock and Willard (1994) identify the dynamic aspect of feedback measures required to succeed. They find "To succeed in turbulent times, we need more and more frequent feedback, not less" (p. 107). The ability to change quickly in a world of change is essential for survival and the organism has a need to monitor feedback from all parts of the system for health and longevity. In living organisms, the comprehensive network is exhibited by the autonomic nervous system. In this study, this "autonomic" comprehensive feedback network is considered analogous to the Balanced Scorecard concept of maintaining total organization health by monitoring not only financial, but also customer, internal business process, and learning and growth metrics, giving us the final hypothesis of this study:

$H_{4\text{-}0}$: The number of categories of Balanced Scorecard metrics used does not correlate to firm value as tested by Kruskal-Wallis one-way ANOVA.

H_4: The number of categories of Balanced Scorecard metrics used correlate to firm value as tested by Kruskal-Wallis one-way ANOVA.

Banker et al. (2000) state that "Recent studies report an increasing use of nonfinancial measures such as product quality, customer satisfaction, and market share in performance measurement and compensation systems (p. 65)", but they also note that there is not much empirical evidence regarding the relationship between nonfinancial measures and financial performance. Studies investigating the correlation of performance to independent variables, or combinations of those variables have failed to investigate the relationship of the measures to the process structure. The salience of processes under consideration as defined by Keen (1997), in conjunction with the Kaplan and Norton (1996) multi-attribute strategy, can be used as a proxy to "quantify" the process structure, the "value added" components of the structure, and the value of managing based on that structure. Identity and Priority processes are most closely linked to generation of positive EVA, and therefore to contribution to the survival of the organization. This relates to living systems which develop control feedback systems for the organism's survival (identity and infrastructure). The objective of this research project is to advance the field of study by finding synergies in the dynamic interactions of financial/nonfinancial, objective/subjective, internal business, customer, learning and growth, identity, priority, background and mandated processes.

Van der Stede et al. (2006) studies the value of financial, nonfinancial objective, nonfinancial subjective, and diversity of these alternative measurements relative to quality manufacturing. Kaplan and Norton (1996) introduced the balanced scorecard multi-attribute concept studied by Osama (2006) with Financial, Internal Business, Learning and Growth, and Customer metrics, and finally, Keen offers a perspective based on Identity, Priority, Background and Mandated processes. This objective of this research is to find synergies in the integrated combination of these perspectives as itemized in Table 2:

TABLE 2

PERFORMANCE MEASURES INTEGRATED PERSPECTIVE

Performance Measures	
System	Breakdown
Balanced Scorecard (BSC)	F = Financial
(H_4)	IB = Internal Business
	C = Customer
Kaplan & Norton (1996)	LG = Learning and Growth
Process Salience	ID = Identity
(H_1)	P = Priority
	B = Background
Keen (1997)	M = Mandated
Measurement Type	F = Financial
(H_{2-3})	N = Nonfinancial
	S = Subjective
Van der Stede et al. (2006)	O = Objective

Chapter IV now defines the methods and techniques used to test these hypotheses.

CHAPTER IV

METHODS AND TECHNIQUES

This research will look for performance correlation (synergies) with select combinations of performance measures. The hypothesis is that more productive combinations will be those with Process Salience Identity (ID - H_{1a}) and Priority (P - H_{1b}), use of Nonfinancial (H_2, H_3) measures combined with multiple Balanced Scorecard (BSC) type measurements (H_4).

Atkinson and Shaffir (1998) advise of the potential for bias in management accounting field research and the need to confirm four primary requirements: 1) Construct Validity, 2) Internal Validity, 3) External Validity, and 4) Reliability. These four primary requirements are addressed in the proposed research as follows:

- Construct Validity: "…asks whether we are measuring what we want to measure. The major threats to construct validity are those created by bias either through the process of observing itself, or bias introduced by the observation method" (Atkinson & Shafir, 1998, p. 60). The potential for introduction of bias by the observation method or process of observing is mitigated by the Survey Consent Form (see Appendix D), which states the subject matter of the research, the mode of observation, and the background training taken into the study.

- Internal Validity: "…asks whether the researcher has taken steps to ensure that the evidence used to infer a casual [*sic*] relationship is complete. That is, can we avoid reporting a spurious correlation as causal" (Atkinson & Shafir, 1998, p. 61). The theoretic basis of the proposed correlation is defined in Chapter 3: Description of the Problem. Results will be compared based on company size, department, and staff position to test for spurious correlation.

- External Validity: "…asks whether we identified clearly the population to which our results apply" (Atkinson & Shafir, 1998, p. 61). The definition of the subject population and the means of selection are defined in Chapter 4; Methods and Techniques. Statistical significance is expected based on a relatively large sample size solicited by email to participate in a web based survey.

- Reliability: "…asks whether the research can be replicated with the same results" (Atkinson & Shafir, 1998, p. 62). This research encompasses a large number of industries with results standardized by industry (NAICS Code) over the same time period (end date of financial comparison will be uniquely defined and identical for all subjects). The following methods will be used to test reliability of the survey instrument: 1) Pilot survey to test questionnaire, 2) Review demographics of non-respondents vs. respondents (size, performance, NAICS category, longevity) to test non-response bias, 3) perform Split-Half reliability test, and 4) Review consistency among organization level responses relative to department and staff position.

Web Based Survey

Surveys are a well-utilized tool for conducting research. In addition, the World Wide Web has been finding increasing utility in surveys (DePaolo, & Sherwood, 2006; Gun, 2002; Roztocki, & Schultz, 2003; Schmidt, 1997) and simulations (Goosen, Wolfe, & Gold, 2007; Thavikulwat, 2007; Thavilulwat, & Chang, 2007). An email solicitation will be sent to various companies to participate in the Web Survey, which is composed of five tiers as follows (See Questionnaire, Appendix E):

North American Industry Classification System (NAICS) to benchmark performance
- Company (coded to provide confidentiality)
  - Rank (1- Executive, 2- VP, 3- Front Line Supervisor, 4- Staff)
    - Department (Corporate, HR, Finance, Marketing, Production)
      - Employee (anonymous)

The determination of the number of financial and nonfinancial measures used are provided by the respondent with a set of alternative measures provided for the respondent to consider. The Balanced Scorecard criteria (Financial, Learning and Growth, Customer, Internal Process) are structured into the survey. The Keen metrics (Identity, Priority, Background, and Mandated) need to be defined by the survey respondent. According to Keen (1997):

> Analyzing the salience of a firm's processes is an important task that requires considerable thought and insight, even under the guidance of the salience/worth matrix. As we have seen, one of several complexities to be considered is that different groups and individuals see the salience of the same process differently. So the question "Whose valuation counts most? Must be answered before a process's importance to the entire firm can be determined. (p. 54).

Keen (1997) suggests that "While asking themselves (and one another) which processes identify the firm, which are critically important, which provide necessary support, and so forth, they [managers] should also consider how business environment changes are likely to affect their processes" (p. 56). The questionnaire will, therefore, request the respondent to rank from 1 – 4 their use of the four process types.

In this research study, survey responses will be solicited from a variety of industries and from various staff levels within the organization (see Appendix F, NAICS Company Listings for subset of companies to be solicited). Consistency among organization level responses will give some indication of internal validity of response, though variances based on respondent function are expected. Industry categories will be defined to benchmark performance level.

The dependent variable is stock price (% change) which reflects the impact of measures on firm value (stock price). The use of stock price as the dependent variable is implicitly supported by Keen (1997) who states “These processes—the ones investors care about—are the major processes that a company can and must pay attention to. They constitute the firm’s process investment portfolio” (p. 56).

In order to perform the analysis: 1) the dependent variable benchmark for the various North American Industry Classification System (NAICS) categories under consideration must be defined, and 2) each company performance relative to the NAICS dependent variable benchmark must then be determined for testing. This process relative to NAICS 31621 is described in detail now:

NAICS Company Definition

NAICS 31621, “US Exchanges Only” is downloaded from Mergent Online as follows in Table 3.

TABLE 3

NAICS 31621 COMPANY LISTINGS

http://www.mergentonline.com.proxy.lib.pdx.edu/compsearchresults.asp?searchtype=compname&searchtext=&codetype=naic&industrycode=31621&Index=null&country=null&usonly=on&bstype=codeandcountry

Prim NAICS 31621
Footwear Manufacturing
US Exchanges Only

US Exchanges Only			Accessed:		9/12/2007
Company Name	SIC	Exchange	Ticker	Active/In	Country
Barry (R.G.) Corp.	3149	ASE	DFZ	Active	United States
Brown Shoe Co., Inc.	3144	NYS	BWS	Active	United States
Cole (Kenneth) Productions, Inc.	3143	NYS	KCP	Active	United States
Crocs Inc	3021	NMS	CROX	Active	United States
Deckers Outdoor Corp.	3021	NMS	DECK	Active	United States
Foot Locker, Inc.	5661	NYS	FL	Active	United States
Iconix Brand Group Inc	3149	NMS	ICON	Active	United States
K-Swiss, Inc	3149	NMS	KSWS	Active	United States
LaCrosse Footwear, Inc.	3021	NMS	BOOT	Active	United States
Madden (Steven) Ltd.	3144	NMS	SHOO	Active	United States
NIKE, Inc	3021	NYS	NKE	Active	United States
Phoenix Footwear Group, Inc.	3144	ASE	PXG	Active	United States
Rocky Brands Inc	3143	NMS	RCKY	Active	United States
Skechers U S A, Inc.	3143	NYS	SKX	Active	United States
Skins Inc	3149	OTC	SKNN	Active	United States
Timberland Co. (The)	3143	NYS	TBL	Active	United States
Weyco Group, Inc	5139	NMS	WEYS	Active	United States
Wolverine World Wide, Inc. (US)	3149	NYS	WWW	Active	United States

Stock Price Histories

Following definition of companies within the specific NAICS code, Stock Price Histories for each respective company within the NAICS code are downloaded from Finance.Yahoo to determine year-to-year stock price changes. All company histories include an “Adjusted Close” which is adjusted for dividends and splits. Though the algorithm for this adjustment was not examined, it is accepted at face value since it is applied consistently to all companies, and the companies are categorized by industry (NAICS) mitigating possible distortions in the data. As noted by Hull (2007) “Dividend ratios vary systematically across industries due primarily to the comparable investment opportunities within an industry and to differences across industries” (Ch.18.1(1)). The adjusted close prices are then converted to a rolling 12-month average on a monthly basis to further eliminate year-end and seasonal distortions. The Adjusted Close 12-Month Rolling Average is then compared over 1-, 2-, 3-, and 5-year periods as shown in the Foot Locker example on Table 4 (dates 3/1/71 – 7/1/06 are hidden to conserve space):

TABLE 4

FOOT LOCKER STOCK PRICE CHANGES

Company: Foot Locker Inc.
NAICS: 31621
Monthly Prices 1/2/70 - 9/14/07
Date Accessed: 9/14/2007
http://finance.yahoo.com/q/hp?s=FL&a=00&b=2&c=1970&d=08&e=14&f=2007&g=m

Date	Open	High	Low	Close	Volume	Adj Close*	Adj Close 12 mo Rolling Average	Comparison	Rolling Average Percent Change
9/4/2007	16.78	16.86	15.91	16.49	998700	**16.49**	**21.14**	1 year	**-7.99%**
8/1/2007	18.42	18.49	14.63	16.71	2315400	**16.71**	21.83	2 year	-14.81%
7/2/2007	21.72	23.6	18.21	18.56	2242400	**18.56**	22.41	3 year	-4.75%
6/1/2007	21.9	22.8	20.78	21.8	2086400	**21.67**	23.08	5 year	58.79%
5/1/2007	23.77	24.4	20.74	21.94	2062000	**21.81**	23.26		
4/2/2007	23.55	24.72	23.04	23.79	1608100	**23.65**	23.41		
3/1/2007	22.46	24.78	21.28	23.55	2054800	**23.29**	23.33		
2/1/2007	22.54	23.47	22.24	22.72	1682700	**22.47**	23.32		
1/3/2007	22.06	22.66	21.1	22.44	2557800	**22.19**	23.32		
12/1/2006	23.03	23.71	21.6	21.93	1809000	**21.56**	23.32		
11/1/2006	23.19	24.92	22.21	22.9	2709500	**22.52**	23.43		
10/2/2006	25	25.89	22.8	23.19	2826500	**22.8**	23.31		
9/1/2006	24.1	25.55	22.34	25.25	2761100	24.74	**22.98**		
8/1/2006	27	27.1	22.5	24.1	2597800	23.61	22.68		
2/1/1971	39.5	48.13	38.5	47.63	209400	3.28	2.37		
1/4/1971	36.5	40	35.5	39.75	107000	2.74	2.28		
12/1/1970	35.13	37.88	35.13	36.5	66700	2.49	2.24		
11/2/1970	33	35	32.25	34.88	57500	2.38			
10/1/1970	33.38	35.25	31.87	33	70100	2.26			
9/1/1970	35.25	35.38	32.75	33.38	47000	2.26			
8/3/1970	31.87	35.5	30.12	35.38	48400	2.4			
7/1/1970	29.25	32.75	28.75	31.87	53300	2.16			
6/1/1970	29.5	31.37	28.12	29.25	42100	1.96			
5/1/1970	31.87	31.87	25.37	29.5	69100	1.98			
4/1/1970	35	35.63	29.12	32.13	49200	2.15			
3/2/1970	34.13	35.88	32.63	34.88	61200	2.32			
2/2/1970	33.63	36	32.88	34.13	94200	2.27			
1/2/1970	37.75	38.88	33.63	33.63	75900	2.23			

* Close price adjusted for dividends and splits

Table 4 demonstrates the method used to determine the rolling average changes in stock price. The average adjusted close price from 10/06 – 9/07 = 21.14 reflected as "Adj close 12 mo Rolling Average" for 9/4/2007. This figure relative to the 9/1/2006 "Adj close 12 mo Rolling Average" (22.98) gives a negative 7.99% 1-year change in stock price [(21.14/22.98-1)% with no rounding difference]. It can be further noted as shown in the period 1/2/1970 – 11/2/1970 that the first year of adjusted close prices are not included in the rolling average since <12 months would be represented in that average. A minimum of two years of stock price history is required to be included in this study, 1 year to define the first 1-year adjusted rolling average, then a 2nd year for the comparison.

Once the stock price changes are consolidated for all companies in the NAICS category under consideration, individual company performance is then compared on a side-to-side basis as in Table 5 (Note: missing cells due to insufficient stock price history in the US Exchange):

TABLE 5

MONTHLY AVERAGE ANNUAL STOCK PRICE CHANGE BY COMPANY

Prim NAICS 31621
Footwear Manufacturing
US Exchanges Only
12 month rolling average year to year adjusted stock price comparison
(% change = (A/B-1)%)

	A	9/07 -	9/07 -	9/07 -	9/07 -
	B	9/06	9/05	9/04	9/02
	Company	1 yr	2 yr	3 yr	5 yr
1	Barry (R.G.) Corp.	41%	105%	197%	71%
2	Brown Shoe Co., Inc.	32%	92%	82%	249%
3	Cole (Kenneth) Productions, Inc.	-4%	-14%	-19%	24%
4	Crocs Inc				
5	Deckers Outdoor Corp.	118%	136%	208%	1563%
6	Foot Locker, Inc.	-8%	-15%	-5%	59%
7	Iconix Brand Group Inc	50%	22%	701%	652%
8	K-Swiss, Inc	-3%	-5%	32%	195%
9	LaCrosse Footwear, Inc.	33%	45%	113%	425%
10	Madden (Steven) Ltd.	16%	158%	152%	213%
11	NIKE, Inc	30%	31%	53%	114%
12	Phoenix Footwear Group, Inc.	-26%	-38%	-57%	
13	Rocky Brands Inc	-35%	-52%	-36%	124%
14	Skechers U S A, Inc.	38%	107%	160%	79%
15	Skins Inc				
16	Timberland Co. (The)	-14%	-22%	-8%	43%
17	Weyco Group, Inc	25%	30%	63%	168%
18	Wolverine World Wide, Inc. (US)	20%	34%	86%	180%
	Count	**16**	**16**	**16**	**15**
	Median	**22%**	**30%**	**73%**	**168%**
	Mean	**20%**	**39%**	**108%**	**277%**
	Standard Deviation	**36%**	**64%**	**178%**	**391%**

Finally, its distance in standard deviations from the mean determines the relative ranking of each company in each NAICS group (Appendix G). As shown in Table 6, Deckers ranks first in NAICS 31621 for the 1-, 2-, and 5-year comparisons with Iconix highest in the 3-year comparison while Rocky Brands ranks lowest in the 1-, 2-, and 3-year comparisons with Timberland coming in lowest in the 5-year comparison:

TABLE 6

COMPANY PERFORMANCE COMPARISONS

Prim NAICS 31621
Footwear Manufacturing
US Exchanges Only
12 month rolling average year to year adjusted stock price comparison
(% change = (A/B-1)%)

A	9/07 -	9/07 -	9/07 -	9/07 -
B	9/06	9/05	9/04	9/02
Company	1 yr	2 yr	3 yr	5 yr
Standard Deviation from Mean				
Barry (R.G.) Corp.	0.60	1.04	0.50	-0.53
Brown Shoe Co., Inc.	0.33	0.84	-0.14	-0.07
Cole (Kenneth) Productions, Inc.	-0.63	-0.81	-0.71	-0.65
Crocs Inc				
Deckers Outdoor Corp.	**2.71**	**1.53**	0.56	**3.28**
Foot Locker, Inc.	-0.76	-0.83	-0.63	-0.56
Iconix Brand Group Inc	0.83	-0.26	**3.33**	0.96
K-Swiss, Inc	-0.61	-0.68	-0.42	-0.21
LaCrosse Footwear, Inc.	0.37	0.10	0.03	0.38
Madden (Steven) Ltd.	-0.09	1.87	0.25	-0.17
NIKE, Inc	0.28	-0.12	-0.30	-0.42
Phoenix Footwear Group, Inc.	-1.25	-1.19	-0.93	
Rocky Brands Inc	**-1.50**	**-1.41**	**-0.80**	-0.39
Skechers U S A, Inc.	0.50	1.07	0.29	-0.51
Skins Inc				
Timberland Co. (The)	-0.92	-0.95	-0.65	**-0.60**
Weyco Group, Inc	0.14	-0.13	-0.25	-0.28
Wolverine World Wide, Inc. (US)	0.02	-0.07	-0.12	-0.25

For purpose of determining correlation, the rankings of the companies in each NAICS category will be broken into 3 levels of comparative performance: high, medium, and low. In this way, the relative performance of all companies under consideration will be standardized and high performers of all NAICS classifications can be compared against the medium and low performers of all NAICS classifications. The testing procedure for each hypothesis under consideration is now defined.

Testing Procedures

Table 7 defines the Dependent and Independent variables and the measurement type for each hypothesis.

TABLE 7

TEST VARIABLES AND TYPE OF MEASURE

	Hypotheses				
	H1a	**H1b**	**H2**	**H3**	**H4**
Dependent Variable	Company Performance	Company Performance	Company Performance	Company Performance	Company Performance
Type of Measure	*Ordinal*	*Ordinal*	*Ordinal*	*Ordinal*	*Ordinal*
Independent Variables	Identity	Priority	Financial	Financial	Number BSC Measures
	Priority	Background	Nonfinancial	Nonfinancial	

A variety of possible statistical tests of association are considered in Table 8. Each test type is either considered an appropriate test for the Hypothesis under consideration or an inappropriate test with an explanation of the reason for rejection.

TABLE 8

STATISTICAL TESTS OF ASSOCIATION FOR EACH HYPOTHESIS

	Hypotheses				
	H1a	**H1b**	**H2**	**H3**	**H4**
Type of Measure	*Ordinal*	*Ordinal*	*Ordinal*	*Ordinal*	*Ordinal*
Association Tests					
Parametric	Inappropriate - minimum interval measure	Inappropriate - minimum interval measure	Inappropriate - minimum interval measure	Inappropriate - minimum interval measure	Inappropriate - minimum interval measure
Non-Parametric	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
Wald-Wolfowitz Runs Test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test
Mann-Whitney or Wilcoxon Test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test
Kolmogorov-Smirnov Test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test
Wilcoxon Matched-pairs Signed-ranks Test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test	Inappropriate - two-sample test
Friedman's Rank Test for k Correlated Samples	Inappropriate - repeated measures test	Inappropriate - repeated measures test	Inappropriate - repeated measures test	Inappropriate - repeated measures test	Inappropriate - repeated measures test
Kruskal-Wallis One-Way Analysis of Variance	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
Chi-square Test	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate

(Blalock, H. M., 1972; Howell, D. C. 2002)

Finally, each Hypothesis is considered relative to possible statistical tests of strength of association in Table 9:

TABLE 9

STATISTICAL TESTS OF STRENGTH OF ASSOCIATION FOR EACH HYPOTHESIS

	Hypotheses				
	H1a	**H1b**	**H2**	**H3**	**H4**
Type of Measure	*Ordinal*	*Ordinal*	*Ordinal*	*Ordinal*	*Ordinal*
Strength of Association Tests					
Cohen's Kappa	Inappropriate maximum two raters only	Inappropriate maximum two raters only	Inappropriate maximum two raters only	Inappropriate maximum two raters only	Inappropriate maximum two raters only
Spearman's r	Appropriate - not necessary to reject null	Appropriate - not necessary to reject null	Appropriate - not necessary to reject null	Appropriate	Appropriate - not necessary to reject null
Kendall's tau	Appropriate - not necessary to reject null	Appropriate - not necessary to reject null	Appropriate - not necessary to reject null	Appropriate	Appropriate - not necessary to reject null
Gamma	Appropriate - not necessary to reject null	Appropriate - not necessary to reject null	Appropriate - not necessary to reject null	Appropriate	Appropriate - not necessary to reject null
Goodman and Kruskal's tau	Appropriate - not necessary to reject null	Appropriate - not necessary to reject null	Appropriate - not necessary to reject null	Appropriate	Appropriate - not necessary to reject null
Cramers Phi (Cramers V)	Appropriate - not necessary to reject null	Appropriate - not necessary to reject null	Appropriate - not necessary to reject null	Appropriate	Appropriate - not necessary to reject null
(Blalock, H. M., 1972; Howell, D. C. 2002)					

The testing methodology proposed for each Hypothesis is now described in further detail:

H_1: Salience of business processes identified for measurement correlate to firm value as measured by Kruskal-Wallis one-way ANOVA.

H_{1a}: Identity business processes using the means results from H_1 have a higher positive correlation to firm value than Priority business processes as measured by the Chi-Square Contingency Test of Association.

H_{1b}: Priority business processes using the means results from H_1 have a higher positive correlation to firm value than Background business processes as measured by the Chi-Square Contingency Test of Association.

Kruskal-Wallis one-way ANOVA is used to test against the null for H_1, followed by the Chi-Square Contingency Test of Association using the means results from H_1 to test against the null for H_{1a} and H_{1b}.

A hypothetical set of responses from 23 respondents (Table 10), summarized by group and rank (rate) in Table 11, is used to demonstrate the tests of these hypotheses.

TABLE 10

HYPOTHETICAL RESPONSES SURVEY QUESTION 1

Respondent	Performance Level	Rank Use (1 - 4)			
		Identity	Priority	Background	Mandated
1	H	1	2	4	3
2	H	1	2	4	3
3	H	1	2	4	3
4	H	4	3	2	1
5	H	2	1	3	4
6	H	2	1	3	4
7	H	1	2	4	3
8	H	2	1	3	4
9	H	2	1	3	4
10	M	1	2	4	3
11	M	2	1	3	4
12	M	2	1	3	4
13	M	4	3	2	1
14	M	3	4	1	2
15	M	3	4	1	2
16	L	3	4	1	2
17	L	3	4	1	2
18	L	3	4	1	2
19	L	3	4	1	2
20	L	3	4	1	2
21	L	4	3	2	1
22	L	4	3	2	1
23	L	2	1	3	4

TABLE 11

HYPOTHETICAL CASE -- RESPONSES BY PERFORMANCE LEVEL AND RESPONSE RANK (RATE)

Identity Rank (rate)	Performance Level H	M	L
1	4	1	0
2	4	2	1
3	0	2	5
4	1	1	2
Total	**9**	**6**	**8**
Priority Rank	**Performance Level H**	**M**	**L**
1	4	2	1
2	4	1	0
3	1	1	2
4	0	2	5
Total	**9**	**6**	**8**
Background Rank (rate)	**Performance Level H**	**M**	**L**
1	0	2	5
2	1	1	2
3	4	2	1
4	4	1	0
Total	**9**	**6**	**8**

The first task is to confirm that High, Middle and Low performing companies do in fact rate Identity, Priority and Background processes differently (Mandated processes are also rated in the survey, but are not included in the test since mandated processes are not a component of the Hypotheses). The Kruskal-Wallis one-way ANOVA is accomplished in a series of four steps. The initial data is placed in a matrix for each salience process (Salience Identity demonstrated in Table 11) showing the dependent variable (company performance) in columns and the independent variable (Salience rating) in rows. The salience ratings then are organized in a matrix to rank all scores without regard to group membership in increasing rank from Rate 1 to 4 (like rates are "tied" and are therefore averaged) to determine a mean ranking level for each rate type (1 – 4) as shown in step two, Table 12.

TABLE 12

KRUSKAL-WALLIS EXAMPLE STEPS 1 AND 2 (IDENTITY)

Step 1 Raw Measures		**Performance Level**		
	Respondent	**High**	**Medium**	**Low**
Identity Rank (Rate 1 - 4)	**1 (H,M,L)**	1	1	3
	2	1	2	3
	3	1	2	3
	4	4	4	3
	5	2	3	3
	6	2	3	4
	7	1		4
	8	2		2
	9	2		

Step 2	**Salience Rank**	**Count**	**Tied**	
Ranking Response Ratings for Analysis	1	1		
	1	2		
	1	3		
	1	4		
	1	5	3	Average
	2	6		
	2	7		
	2	8		
	2	9		
	2	10		
	2	11		
	2	12	9	Average
	3	13		
	3	14		
	3	15		
	3	16		
	3	17		
	3	18		
	3	19	16	Average
	4	20		
	4	21		
	4	22		
	4	23	21.5	Average

In this test, Rank (rate) 1 is considered by respondent to be most used type of process and Rank (rate) 4 is least used, so the lower mean number reflects more often used process types.

Once the mean ranking levels for each rated salience process are identified, the raw data rates (1 – 4) are replaced by the ranked means for those tied rates in the raw data matrix as exhibited in Step 3, followed by the Kruksall-Wallis one-way ANOVA calculation in Step 4 Table 13, where the H statistic is treated as though it is a value of chi-square with degrees of freedom equal to k-1 where k is the number of groups.

TABLE 13

KRUSKAL-WALLIS EXAMPLE STEPS 3 AND 4 (IDENTITY)

Step 3

Performance Level

Ranked Measures (example)

Respondent	High	Medium	Low	Total
1 (H,M,L)	3.0	3.0	16	
2	3.0	9.0	16	
3	3.0	9.0	16	
4	21.5	21.5	16	
5	9.0	16	16	
6	9.0	16	21.5	
7	3.0		21.5	
8	9.0		9.0	
9	9.0			
Count	9	6	8	23
sum of ranks	69.5	74.5	132.0	276
average of ranks	7.72	12.42	16.50	12.00

Step 4

Performance Level

Ranked Measures (example)

	High	Medium	Low	All
counts (n)	9	6	8	23
sums (R)	69.5	74.5	132	276
means	7.72	12.42	16.50	12.00

H = $12/[N(N+1)]\ \Sigma^{k}_{i=1} R^{2}_{i}/n_i - 3(N+1)$

where

k = number of groups

n_i = number of observations in group i

R_i = sum of the ranks in group i

$N = \Sigma n_i$ = total sample size

H = $12/[23(23+1)](69.5^2/9 + 74.5^2/6 + 132^2/8) - 3(23 + 1)$

H = 7.12

df = 3 - 1 = 2 Chi Square at 0.05 = 5.991

7.12 > 5.991 Reject null at .05

In this Example, the null hypothesis -- no difference in ratings of use of salience Identity by High, Middle and Low performers -- is rejected at a 0.05 significance level.

For the purpose of demonstration of reasonableness in this hypothetical case Tables 14 – 17 display Priority and Background responses and results using the initial hypothetical responses from Table 10.

TABLE 14

KRUSKAL-WALLIS EXAMPLE STEPS 1 AND 2 (PRIORITY)

Step 1	**Performance Level**			
Raw Measures	Respondent	**High**	**Medium**	**Low**
Priority Rank (Rate 1 - 4)	**1 (H,M,L)**	2	2	4
	2	2	1	4
	3	2	1	4
	4	3	3	4
	5	1	4	4
	6	1	4	3
	7	2		3
	8	1		1
	9	1		

Step 2	Salience Rank	Count	Tied	
Ranking Response Ratings for Analysis	1	1		
	1	2		
	1	3		
	1	4		
	1	5		
	1	6		
	1	7	4	Average
	2	8		
	2	9		
	2	10		
	2	11		
	2	12	10	Average
	3	13		
	3	14		
	3	15		
	3	16	14.5	Average
	4	17		
	4	18		
	4	19		
	4	20		
	4	21		
	4	22		
	4	23	20	Average

TABLE 15

KRUSKAL-WALLIS EXAMPLE STEPS 3 AND 4 (PRIORITY)

Step 3 — **Performance Level**

Ranked Measures (example)

Respondent	High	Medium	Low	Total
1 (H,M,L)	10.0	10.0	20	
2	10.0	4.0	20	
3	10.0	4.0	20	
4	14.5	14.5	20	
5	4.0	20	20	
6	4.0	20	14.5	
7	10.0		14.5	
8	4.0		4.0	
9	4.0			
Count	9	6	8	23
sum of ranks	70.5	72.5	133.0	276
average of ranks	7.83	12.08	16.63	12.00

Step 4 — **Performance Level**

Ranked Measures (example)

	High	Medium	Low	All
counts (n)	9	6	8	23
sums (R)	70.5	72.5	133	276
means	7.83	12.08	16.63	12.00

H = $12/[N(N+1)]\ \Sigma^{k}_{i=1} R^2_i/n_i - 3(N+1)$

where
k = number of groups
n_i = number of observations in group i
R_i = sum of the ranks in group i
N = Σn_i = total sample size

H = $12/[23(23+1)](70.5^2/9 + 72.5^2/6 + 133^2/8) - 3(23 + 1)$
H = 7.12

df = 3 - 1 = 2 Chi Square at 0.05 = 5.991
7.12 > 5.991 Reject null at .05

TABLE 16

KRUSKAL-WALLIS EXAMPLE STEPS 1 AND 2 (BACKGROUND)

Step 1 Raw Measures	Performance Level			
	Respondent	High	Medium	Low
Background Rank (Rate 1 - 4)	**1 (H,M,L)**	4	4	1
	2	4	3	1
	3	4	3	1
	4	2	2	1
	5	3	1	1
	6	3	1	2
	7	4		2
	8	3		3
	9	3		
Step 2	Salience Rank	Count	Tied	
Ranking Response Ratings for Analysis	1	1		
	1	2		
	1	3		
	1	4		
	1	5		
	1	6		
	1	7	4	Average
	2	8		
	2	9		
	2	10		
	2	11	9.5	Average
	3	12		
	3	13		
	3	14		
	3	15		
	3	16		
	3	17		
	3	18	15	Average
	4	19		
	4	20		
	4	21		
	4	22		
	4	23	21	Average

TABLE 17

KRUSKAL-WALLIS EXAMPLE STEPS 3 AND 4 (BACKGROUND)

Step 3 **Performance Level**

Ranked Measures (example)

Respondent	High	Medium	Low	Total
1 (H,M,L)	21.0	21.0	4	
2	21.0	15.0	4	
3	21.0	15.0	4	
4	9.5	9.5	4	
5	15.0	4	4	
6	15.0	4	9.5	
7	21.0		9.5	
8	15.0		15.0	
9	15.0			
Count	9	6	8	23
sum of ranks	153.5	68.5	54.0	276
average of ranks	17.06	11.42	6.75	12.00

Step 4 **Performance Level**

Ranked Measures (example)

	High	Medium	Low	All
counts (n)	9	6	8	23
sums (R)	153.5	68.5	54	276
means	17.06	11.42	6.75	12.00

H = $12/[N(N+1)]\ \Sigma^{k}_{i=1} R^{2}_{i}/n_i - 3(N+1)$

where

k = number of groups

n_i = number of observations in group i

R_i = sum of the ranks in group i

N = Σn_i = total sample size

H = $12/[23(23+1)](153.55^2/9 + 68.5^2/6 + 54^2/8) - 3(23 + 1)$

H = 9.84

df = 3 - 1 = 2 Chi Square at 0.05 = 5.991

9.84 > 5.991 Reject null at .05

A summary of the results in Table 18 shows that in this hypothetical case, for all three salience types, the null hypothesis (no difference in rating of salience types exists for High, Middle and Low performers) is rejected at a 0.05 level of significance.

TABLE 18

KRUSKAL-WALLIS EXAMPLE RESULTS (IDENTITY, PRIORITY, BACKGROUND)

Performance Level Ranked Measures (example)				
Identity				
	High	**Medium**	**Low**	**All**
counts (n)	9	6	8	23
sums (R)	69.5	74.5	132	276
means	7.72	12.42	16.50	12.00
H =	$12/[N(N+1)]\ \Sigma^{k}_{i=1} R^2_i/n_i - 3(N+1)$			
H =	**7.12**			
df =	3 - 1 = 2	Chi Square at 0.05 = 5.991		
	7.12 > 5.991	**Reject null at .05**		
Priority				
	High	**Medium**	**Low**	**All**
counts (n)	9	6	8	23
sums (R)	70.5	72.5	133	276
means	7.83	12.08	16.63	12.00
H =	$12/[N(N+1)]\ \Sigma^{k}_{i=1} R^2_i/n_i - 3(N+1)$			
H =	**7.12**			
df =	3 - 1 = 2	Chi Square at 0.05 = 5.991		
	7.12 > 5.991	**Reject null at .05**		
Background				
	High	**Medium**	**Low**	**All**
counts (n)	9	6	8	23
sums (R)	153.5	68.5	54	276
means	17.06	11.42	6.75	12.00
H =	$12/[N(N+1)]\ \Sigma^{k}_{i=1} R^2_i/n_i - 3(N+1)$			
H =	**9.84**			
df =	3 - 1 = 2	Chi Square at 0.05 = 5.991		
	9.84 > 5.991	**Reject null at .05**		

The final step is to use the Chi-Square Contingency Test of Association to reject the null for the two specific sub-hypotheses as demonstrated in this hypothetical case using The Kruskal-Wallis group means.

H_{1a}: Identity business processes using the means results from H_1 have a higher positive correlation to firm value than Priority business processes as measured by the Chi-Square Contingency Test of Association.

TABLE 19

CHI-SQUARE CONTINGENCY TEST EXAMPLE H_{1A}

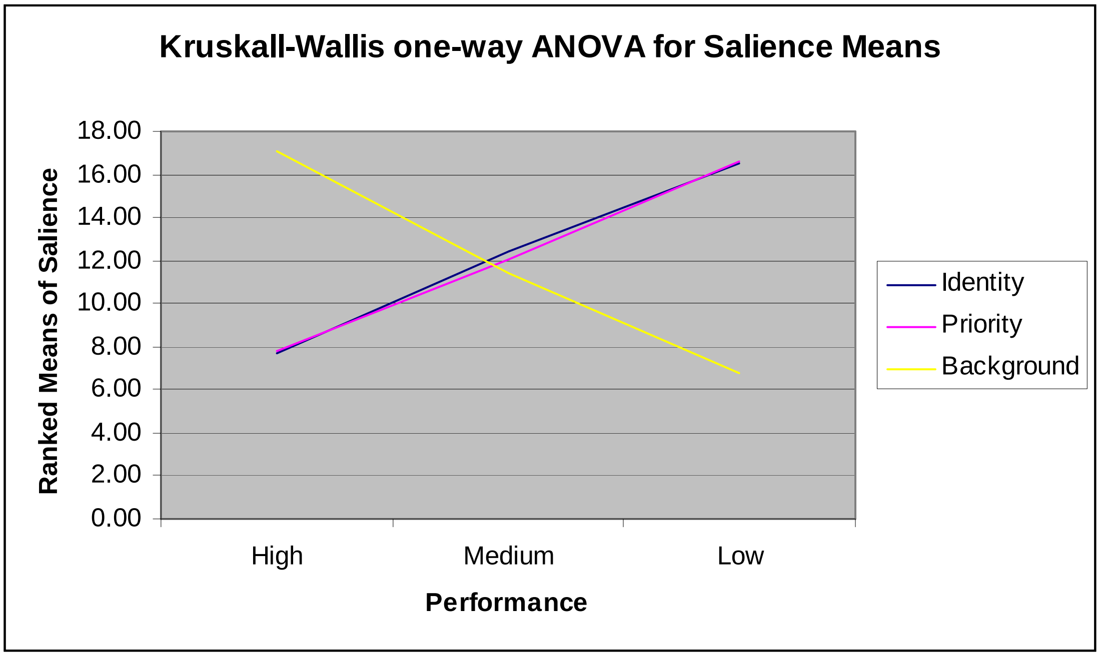
Identity vs. Priority (H1a)				
Observed	**High**	**Medium**	**Low**	**Total**
Identity	7.72	12.42	16.5	36.64
Priority	7.83	12.08	16.63	36.54
Total	15.55	24.5	33.13	73.18
Expected				
Identity	7.79	12.27	16.59	
Priority	7.76	12.23	16.54	
Observed	**Expected**	O - E	(O-E)^2	(O-E)^2/E
7.72	7.79	-0.07	0.004	0.000553144
7.83	7.76	0.07	0.004	0.000554658
12.42	12.27	0.15	0.023	0.001914834
12.08	12.23	-0.15	0.023	0.001920074
16.5	16.59	-0.09	0.008	0.000462999
16.63	16.54	0.09	0.008	0.000464266
df =2	Chi Square at 0.05 = 5.991			0.005869976
	0.00587 < 5.991		Cannot reject Null at 0.05	

H_{1b}: Priority business processes using the means results from H_1 have a higher positive correlation to firm value than Background business processes as measured by the Chi-Square Contingency Test of Association.

TABLE 20

CHI-SQUARE CONTINGENCY TEST EXAMPLE H_{1B}

Priority vs. Background (H1b)				
Observed	**High**	**Medium**	**Low**	**Total**
Priority	7.83	12.08	16.63	36.54
Background	17.06	11.42	6.75	35.22
Total	24.89	23.50	23.38	71.76
Expected				
Identity	12.67	11.97	11.90	
Priority	12.22	11.53	11.47	
Observed	**Expected**	O - E	(O-E)^2	(O-E)^2/E
7.833333333	12.67	-4.84	23.425	1.848363203
17.05555556	12.22	4.84	23.425	1.917603938
12.08333333	11.97	0.12	0.014	0.00114984
11.41666667	11.53	-0.12	0.014	0.001192914
16.625	11.90	4.72	22.303	1.873833581
6.75	11.47	-4.72	22.303	1.944028451
df =2	Chi Square at 0.025 = 7.378			7.586171927
	7.586 > 7.378		Reject null at .025	



<u>Figure 4</u>: H_1 Hypothetical Case Results

The concluding results of this hypothetical test case is that evidence supports the hypothesis that High, Middle and Low performing organizations rank their common salience process types differently, and that Priority business processes measured correlate more positively to firm value than Background business processes (lower mean ranking level for high performers in Priority performance measures and lower mean ranking level for low performers in Background performance measurement) at a 0.05 significance level. It could not be demonstrated, however, that Identity business processes measured correlate more positively to firm value than Priority business processes at a 0.05 significance level.

H_2: Nonfinancial performance measures are more correlated to firm value than financial measures as measured by Kruskal-Wallis one-way ANOVA.

Kruskal-Wallis one-way ANOVA is the alternative that will be used in this hypothesis test. To demonstrate the logic, two extreme examples will be used to show non-rejection of null then rejection of null. This will be followed by a hypothetical case using survey data measures.

To perform this test, the data is compiled and then ranked. Example 1 as follows in Table 21 where the number of measures are defined then ranked from 1 – 23 in increasing order (tied numbers would be averaged).

TABLE 21

KRUSKAL-WALLIS ONE-WAY ANOVA TEST RANKED DATA H_2 EXAMPLE 1

Performance Level

Ranked Measures (example)

Financial or Nonfinancial

Respondent	High	Medium	Low	Total
1 (H,M,L)	1	2	3	
2	4	5	6	
3	7	8	9	
4	10	11	12	
5	13	14	15	
6	16	17	18	
7	19		20	
8	21		22	
9	23			
sum of ranks	114	57	105	276
average of ranks	12.67	9.50	13.13	12.00

The Null Hypothesis cannot be rejected based on this sample data as exhibited in Table 22.

TABLE 22

KRUSKAL-WALLIS TEST RESULTS H_2 EXAMPLE 1

Performance Level

Ranked Measures (example)

	High	Medium	Low	All
counts (n)	9	6	8	23
sums (R)	114	57	105	276
means	12.67	9.50	13.13	12.00

$12/[N(N+1)]\ \Sigma^{k}_{i=1} R^2_i/n_i - 3(N+1)$

where

k = number of groups

n_i = number of observations in group i

R_i = sum of the ranks in group i

N = Σn_i = total sample size

H = $12/[23(23+1)](114^2/9 + 57^2/6 + 105^2/8) - 3(23 + 1)$

H = 1.12

df = 3 - 1 = 2 Chi Square at 0.05 = 5.991

1.12 < 5.991 Cannot reject null at .05

Table 23 gives an example (2) using the same process but with different responses where the null would be rejected at 0.05.

TABLE 23

KRUSKAL-WALLIS TEST RESULTS H_2 EXAMPLE 2

Performance Level

Ranked Measures (example)

Respondent	**High**	**Medium**	**Low**	**Total**
1 (H,M,L)	15	9	1	
2	16	10	2	
3	17	11	3	
4	18	12	4	
5	19	13	5	
6	20	14	6	
7	21		7	
8	22		8	
9	23			
sum of ranks	171	69	36	276
average of ranks	19	11.5	4.5	12

Performance Level

Ranked Measures (example)

	High	**Medium**	**Low**	**All**
counts	9	6	8	23
sums	171	69	36	276
means	19	11.5	4.5	12

H = $12/[N(N+1)]\ \Sigma^{k}_{i=1} R^{2}_{i}/n_{i} - 3(N+1)$

H = 19.40

df = 3 - 1 = 2 Chi Square at 0.001 = 13.816

19.4 > 13.816 Reject null at .001

Having demonstrated an extreme example to show the logic of the test, the reasonableness of the test will be demonstrated using a hypothetical set of responses from 23 respondents as given in Table 24.

TABLE 24

HYPOTHETICAL SURVEY RESPONSE FOR H_2

Respondent	Performance Level	Clockspeed	Number of Measures Used	
			Financial	Nonfinancial
1	H	H	2	5
2	H	H	1	4
3	H	H	3	6
4	H	H	4	5
5	H	H	2	3
6	H	M	1	4
7	H	M	5	3
8	H	M	2	5
9	H	L	3	2
10	M	H	1	7
11	M	H	5	2
12	M	H	4	4
13	M	M	3	3
14	M	M	2	5
15	M	L	1	1
16	L	H	5	1
17	L	H	4	2
18	L	H	3	3
19	L	H	3	4
20	L	M	2	2
21	L	M	4	4
22	L	L	3	3
23	L	L	1	1

As in the example for H_1, the raw responses are then organized in a matrix to rank all scores without regard to group membership in increasing rank based on the number of measures used from lowest to highest (like rates are "tied" and are therefore averaged) to determine a mean ranking for financial and nonfinancial as demonstrated in Table 25.

TABLE 25

HYPOTHETICAL RESPONSES RANKING CONVERSIONS H_2

Financial	Number of Measures	Tied - Use Avg.	Nonfinancial	Response Count	Tied - Use Avg.
1	1		1	1	
1	2		1	2	
1	3		1	3	2
1	4		2	4	
1	5	3	2	5	
2	6		2	6	
2	7		2	7	5.5
2	8		3	8	
2	9		3	9	
2	10	8	3	10	
3	11		3	11	
3	12		3	12	10
3	13		4	13	
3	14		4	14	
3	15		4	15	
3	16	13.5	4	16	
4	17		4	17	15
4	18		5	18	
4	19		5	19	
4	20	18.5	5	20	
5	21		5	21	19.5
5	22		6	22	22
5	23	22	7	23	23

The raw number of measures response data from Table 24 is then replaced with the rankings derived from Table 25 as summarized in Table 26.

.

TABLE 26

RANKED SURVEY RESPONSE DATA H_2

Respondent	Performance Level	Clockspeed	Ranked Responses	
			Financial	Nonfinancial
1	H	H	8	19.5
2	H	H	3	15
3	H	H	13.5	22
4	H	H	18.5	19.5
5	H	H	8	10
6	H	M	3	15
7	H	M	22	10
8	H	M	8	19.5
9	H	L	13.5	5.5
10	M	H	3	23
11	M	H	22	5.5
12	M	H	18.5	15
13	M	M	13.5	10
14	M	M	8	19.5
15	M	L	3	2
16	L	H	22	2
17	L	H	18.5	5.5
18	L	H	13.5	10
19	L	H	13.5	15
20	L	M	8	5.5
21	L	M	18.5	15
22	L	L	13.5	10
23	L	L	3	2

The ranked response means for High, Medium and Low performers for financial and nonfinancial measure use is then determined (Table 27) followed by the Kruskal-Wallis one-way ANOVA test of the ranked means for each organization performance level in Table 28.

TABLE 27

HIGH, MIDDLE AND LOW PERFORMER FIANCIAL AND NONFINANCIAL RANKED MEANS H_2

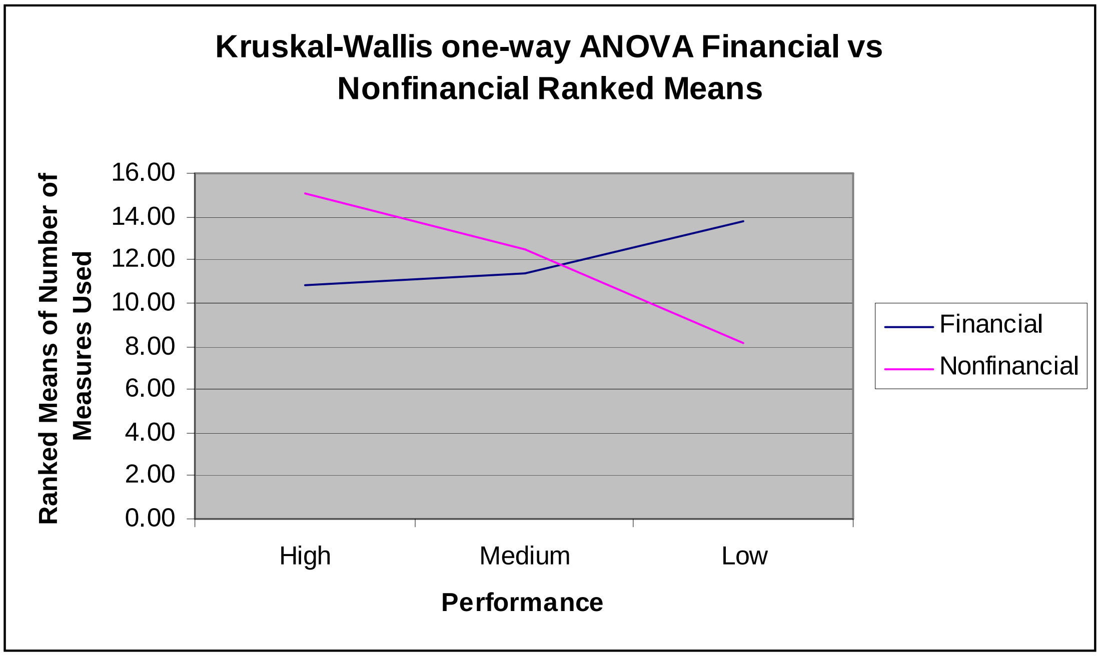
Respondent	Level	Clockspeed	Ranked Responses	
			Financial	Nonfinancial
1	H	H	8	19.5
2	H	H	3	15
3	H	H	13.5	22
4	H	H	18.5	19.5
5	H	H	8	10
6	H	M	3	15
7	H	M	22	10
8	H	M	8	19.5
9	H	L	13.5	5.5
Count			9	9
sum of ranks			97.5	136.0
average of ranks			10.83	15.11
Respondent	**Level**	**Clockspeed**	**Ranked Responses**	
			Financial	**Nonfinancial**
1	M	H	3	23
2	M	H	22	5.5
3	M	H	18.5	15
4	M	M	13.5	10
5	M	M	8	19.5
6	M	L	3	2
Count			6	6
sum of ranks			68.0	75.0
average of ranks			11.33	12.50
Respondent	**Level**	**Clockspeed**	**Ranked Responses**	
			Financial	**Nonfinancial**
1	L	H	22	2
2	L	H	18.5	5.5
3	L	H	13.5	10
4	L	H	13.5	15
5	L	M	8	5.5
6	L	M	18.5	15
7	L	L	13.5	10
8	L	L	3	2
Count			8	8
sum of ranks			110.5	65.0
average of ranks			13.81	8.13

TABLE 28

KRUSKAL-WALLIS TEST OF RANKED MEANS H_2

Performance Level Ranked Number of Financial Measures				
	High	**Medium**	**Low**	**All**
counts (n)	9	6	8	23
sums (R)	97.5	68	110.5	276
means	10.83	11.33	13.81	12.00
H =	$12/[N(N+1)]\ \Sigma^{k}_{i=1} R^2_i/n_i - 3(N+1)$			
H =	0.90			
df =	3 - 1 = 2	Chi Square at 0.05 = 5.991		
	0.90 < 5.991	Cannot reject null at .05		

Performance Level Ranked Number of Nonfinancial Measures				
	High	**Medium**	**Low**	**All**
counts (n)	9	6	8	23
sums (R)	136.0	75	65	276
means	15.11	12.5	8.125	12.00
H =	$12/[N(N+1)]\ \Sigma^{k}_{i=1} R^2_i/n_i - 3(N+1)$			
H =	4.54			
df =	3 - 1 = 2	Chi Square at 0.05 = 5.991		
	4.54 < 5.991	Cannot reject null at .05		



<u>Figure 5:</u> H_2 Hypothetical Case Results

In this hypothetical case, financial measures appear to be used by high performers less than by low performers (lower ranking mean of 10.83 compared to 13.81 with middle performers in the middle ranking at 11.33), though statistical significance is not established. The nonfinancial measures appear to be used more by high performers (higher ranking mean of 15.11 compared to 8.13 with middle performers in the middle ranking at 12.5) though this was not statistically significant at 0.05 level. In conclusion, the hypothetical evidence appears to support the hypothesis that nonfinancial performance measures correlate more positively to firm value than financial measures, but not at a statistically significant level.

H_3: The relative importance of nonfinancial performance measures compared to financial measures using the results from H_2 is greater in high clock-speed industries than in low clock-speed industries as measured by Cramer's Phi.

The results from H_2 (Financial / Nonfinancial) relative to three levels of clockspeed (high, medium, low) will be compared for strengths of association differences between the three-clockspeed categories. According to Howell (2002) "If I were going to retain only one measure of association, it would be Cramer's $Ø_c$…[which] is not constrained by the size of the table…." (p. 165) and will therefore be used for this test.

For this test, the Chi Square value for each alternative needs to be determined since "…$Ø_c = (\chi^2/(N(k-1)))^{1/2}$ where N is the sample size and k is defined as the smaller of R and C" (Howell, 2002, p. 165).

The methodology will be demonstrated using the same hypothetical survey responses used to demonstrate H_2 methodology in Table 24, and the ranked means in Table 26.

The first step is to break the data from the previous example into clockspeed tables to determine the ranking means for the variables as demonstrated in Tables 29 – 31.

TABLE 29

HIGH CLOCKSPEED FINANCIAL AND NONFINANCIAL RANKED MEANS H_3

Financial High Clockspeed				
	Performance			
Observed	**High**	**Medium**	**Low**	**Total**
	8	3	22	
	3	22	18.5	
	13.5	18.5	13.5	
	18.5		13.5	
	8			
Count	5	3	4	12
Mean	10.20	14.50	16.88	41.58
Noninancial High Clockspeed				
	Performance			
Observed	**High**	**Medium**	**Low**	**Total**
	19.5	23	2	
	15	5.5	5.5	
	22	15	10	
	19.5		15	
	10			
Count	5	3	4	12
Mean	17.20	14.50	8.13	39.83

TABLE 30

MEDIUM CLOCKSPEED FINANCIAL AND NONFINANCIAL RANKED MEANS
H_3

Financial Medium Clockspeed				
	Performance			
Observed	High	Medium	Low	Total
	3	13.5	8	
	22	8	18.5	
	8			
Count	3	2	2	7
Mean	11.00	10.75	13.25	35.00
Nonfinancial Medium Clockspeed				
	Performance			
Observed	High	Medium	Low	Total
	15	10	5.5	
	10	19.5	15	
	19.5			
Count	3	2	2	7
Mean	14.83	14.75	10.25	

TABLE 31

LOW CLOCKSPEED FINANCIAL AND NONFINANCIAL RANKED MEANS H_3

Financial Low Clockspeed Performance				
Observed	**High**	**Medium**	**Low**	**Total**
	13.5	3	13.5	
			3	
Count	1	1	2	4
Mean	13.50	3.00	8.25	
Noninancial Low Clockspeed Performance				
Observed	**High**	**Medium**	**Low**	**Total**
	5.5	2	10	
			2	
Count	1	1	2	4
Mean	5.50	2.00	6.00	

Chi-Squares are then calculated for the means for each clockspeed and performance level, followed by calculation of the Cramer's Phi as shown in Tables 32 – 34.

TABLE 32

CRAMER'S PHI FOR HIGH CLOCKSPEED FINANCIAL VS. NONFINANCIAL RANKED USE MEANS H_3

	High Clockspeed Performance			
Observed	**High**	**Medium**	**Low**	**Total**
Financial	10.20	14.50	16.88	41.58
Nonfinancial	17.20	14.50	8.13	39.83
Total	27.40	29.00	25.00	81.40
Count	10.00	6.00	8.00	24.00
Expected				
Financial	13.99	14.81	12.77	
Nonfinancial	13.41	14.19	12.23	
Observed	**Expected**	O - E	(O-E)^2	(O-E)^2/E
10.20	13.99	-3.79	14.398	1.028865
17.20	13.41	3.79	14.398	1.074075
14.50	14.81	-0.31	0.097	0.006561
14.50	14.19	0.31	0.097	0.006849
16.875	12.77	4.11	16.861	1.320524
8.125	12.23	-4.11	16.861	1.37855
df =2	Chi Square at 0.05 = 5.991			4.815424

$\phi_c=(\chi^2/(N(k-1)))^{1/2}$ where N = Sample size, k = smaller of R and C

$\phi_c=$ 0.44793154

TABLE 33

CRAMER'S PHI FOR MEDIUM CLOCKSPEED FINANCIAL VS. NONFINANCIAL RANKED USE MEANS H_3

	Medium Clockspeed Performance			
Observed	**High**	**Medium**	**Low**	**Total**
Financial	11.00	10.75	13.25	35.00
Nonfinancial	14.83	14.75	10.25	39.83
Total	25.83	25.50	23.50	74.83
Count	6.00	4.00	4.00	14.00
Expected				
Financial	12.08	11.93	10.99	
Nonfinancial	13.75	13.57	12.51	
Observed	**Expected**	O - E	(O-E)^2	(O-E)^2/E
11.00	12.08	-1.08	1.172	0.096968
14.83	13.75	1.08	1.172	0.085202
10.75	11.93	-1.18	1.384	0.116057
14.75	13.57	1.18	1.384	0.101975
13.25	10.99	2.26	5.103	0.464255
10.25	12.51	-2.26	5.103	0.407923
df =2	Chi Square at 0.05 = 5.991			1.27238
$\phi_c=(\chi^2/(N(k-1)))^{1/2}$		where	N = Sample size k = smaller of R and C	
$\phi_c=$	0.30147016			

TABLE 34

CRAMER'S PHI FOR LOW CLOCKSPEED FINANCIAL VS. NONFINANCIAL RANKED USE MEANS H_3

	Low Clockspeed Performance			
Observed	**High**	**Medium**	**Low**	**Total**
Financial	13.50	3.00	8.25	24.75
Nonfinancial	5.50	2.00	6.00	13.50
Total	19.00	5.00	14.25	38.25
Count	2.00	2.00	4.00	8.00
Expected				
Financial	12.29	3.24	9.22	
Nonfinancial	6.71	1.76	5.03	
Observed	**Expected**	O - E	(O-E)^2	(O-E)^2/E
13.50	12.29	1.21	1.454	0.11828
5.50	6.71	-1.21	1.454	0.216847
3.00	3.24	-0.24	0.055	0.017112
2.00	1.76	0.24	0.055	0.031373
8.25	9.22	-0.97	0.942	0.102167
6	5.03	0.97	0.942	0.187307
df =2	Chi Square at 0.05 = 5.991			0.673086
$\phi_c=(\chi^2/(N(k-1)))^{1/2}$		where	N = Sample size k = smaller of R and C	
$\phi_c=$	0.29006166			

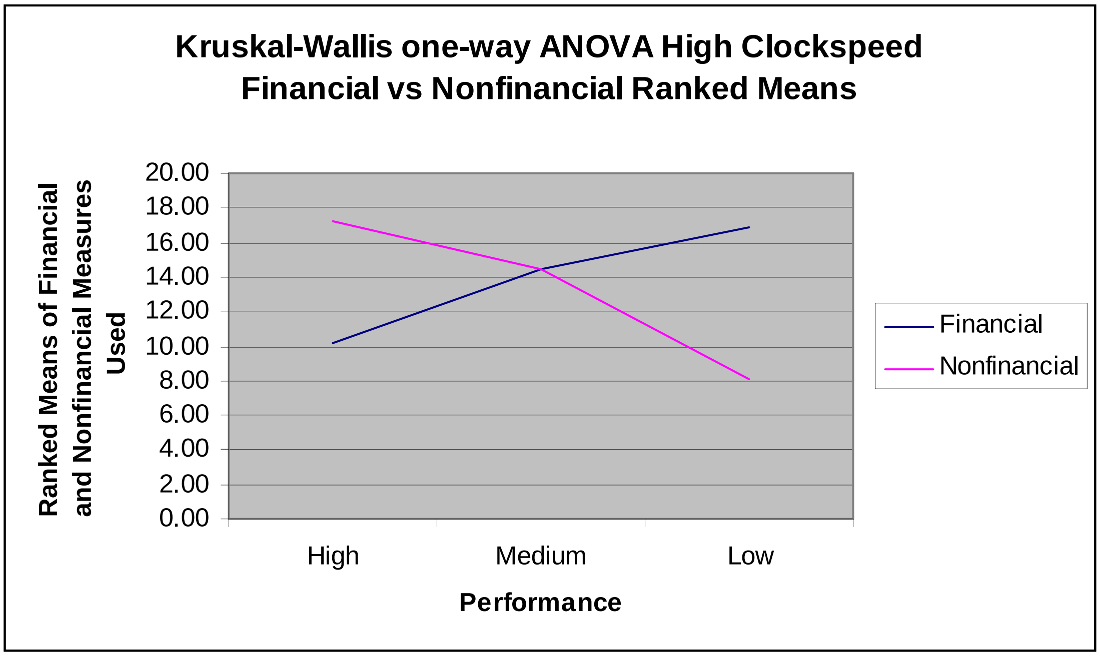


Figure 6: H$_3$ High Clockspeed Hypothetical Case Results

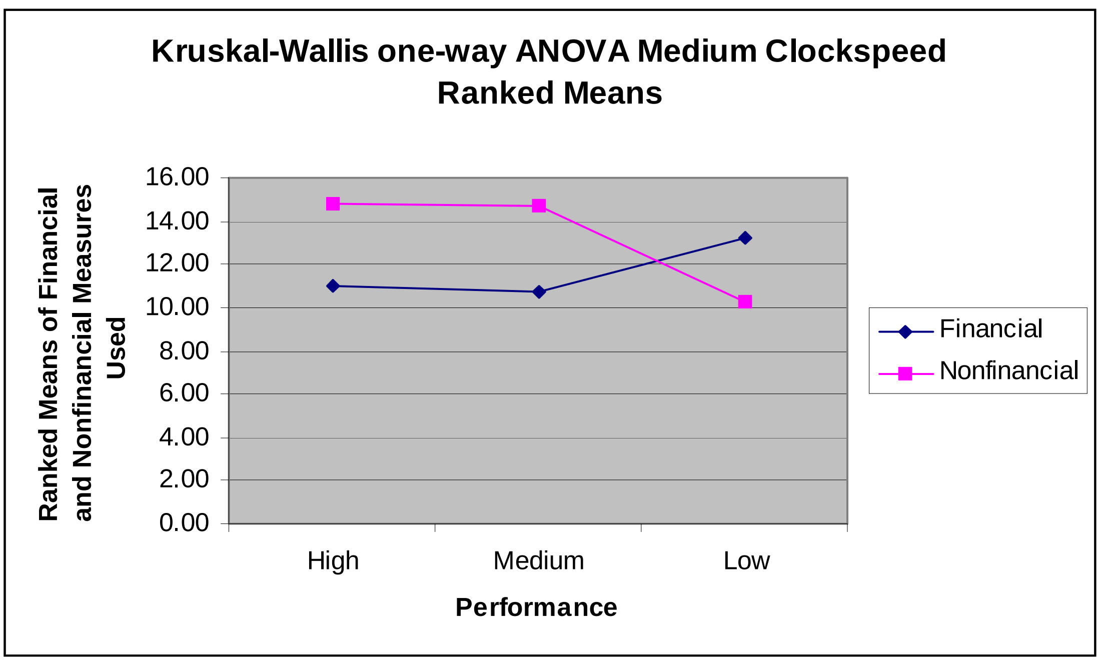
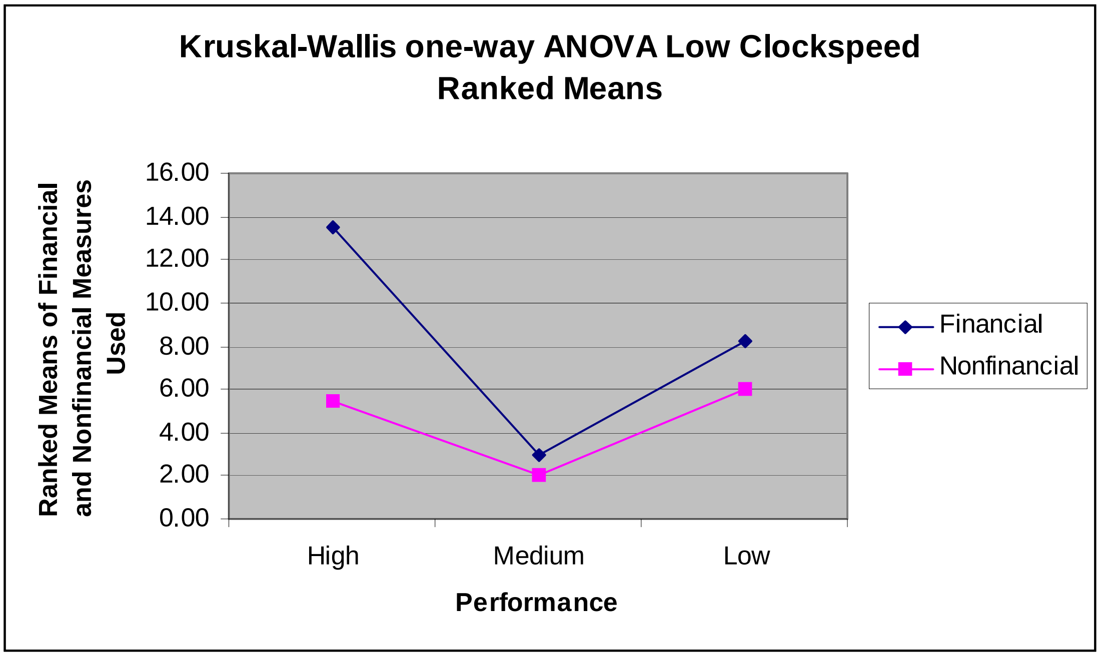


Figure 7: H$_3$ Medium Clockspeed Hypothetical Case Results



<u>Figure 8:</u> H_3 Low Clockspeed Hypothetical Case Results

The results of this hypothetical test gives evidence to support the hypothesis that the relative importance of nonfinancial performance measures compared to financial measures is greater in high clockspeed industries than in low clock-speed industries. The degree of association for High Clockspeed industries is 0.45 compared to 0.30 for Medium and 0.29 for Low Clockspeed industries.

H_4: The number of types of Balanced Scorecard metrics used correlate to firm value as measured by Kruskal-Wallis one-way ANOVA.

Kruskal-Wallis one-way ANOVA is the alternative that will be used with the same methodology as described in Tables 10 - 13 for Hypothesis 1.

Conclusions

Viable testing methods are defined for each of the hypotheses under consideration and examples of their use provided. In all cases nonparametric tests are necessary. It is anticipated that the questionnaire will yield a much higher number of responses than are used in the hypothetical cases. The questionnaire is designed to yield a high response rate by limiting the number of questions to 10, thereby requiring minimal time of respondents. Once the infrastructure is set up (database of contact email addresses and web based survey), a large volume of requests for response can be sent to a broad range of companies for little cost.

Following the test, Chapter 5 documents the results, and Chapter 6 discusses the results and provides recommendations for further research.

CHAPTER V

RESULTS

Implementation of Methods and Techniques as proposed in Chapter IV with subsequent results are documented in this chapter in the following sequence: 1) Sample Definition and Survey Setup; 2) Pilot Test Observations / Conclusions / Plan; 3) Dissertation Survey Results; and finally 4) Hypothesis Testing relative to each hypothesis under consideration. Chapter VI concludes this research with a discussion of: results and implications of the research; its limitations and strengths; then provides suggestions for further research.

Sample Definition and Survey Setup

The first step taken in sample definition and setup is to identify and define NAICS Categories to standardize performance among industry types. A total of 19,720 six-digit NAICS codes for a total of 13,286 companies are identified using Mergent Online, of which 7,268 companies are later determined to be active. This resolution is deemed too high to be of use so the number of codes, and the number of companies for each code, are determined based on 2-Digit, 3-Digit, and 4-Digit Code Classification Schemes (Appendix H). Results of the search are summarized as follows in Table 35:

TABLE 35

NUMBER OF COMPANIES PER NAICS CATEGORY SUMMARY

Total 6-Digit NAICS Codes 19,720	**2-Digit Code**	**3-Digit Code**	**4-Digit Code**
Total (Number of Companies)	13,286	13,286	13,286
Max (Companies / Category)	3,573	1,628	1,484
Min (Companies / Category)	15	1	1
Count (NAICS Categories)	24	87	289
Average (Companies / Category)	554	153	46
Standard Deviation (Companies / Category)	834.53	282.22	134.13

A 3-Digit Code Classification Scheme is used since it has greater resolution than a 2-Digit Scheme (87 total categories compared to 24 categories) with substantially fewer categories than a 4-Digit classification scheme (87 total categories compared to 289 categories) while the maximum number of companies for any one category is comparable to that of the 4-Digit Scheme (1,628 companies compared to 1,484 companies). The 3-Digit Code Classification Scheme is then used to download all companies from Mergent Online. A systematic selection process is defined based on a 5% sampling ratio, which is subsequently increased to a 10% sampling ratio for the pilot test (Appendix I). The first date with stock price history is then found for each sample company from Yahoo Finance. By converting the date to years publicly traded as of 12/31/08 a table is created with the number of companies at 3, 5, 10, 15, 20, 25, 30 years. LexisNexis is used to find general email addresses for companies that are publicly traded ≥ 5 years and to the extent possible for executives. For those not available Hoovers Online is used to augment the contact data. Response rate is anticipated to be 2% - 5%. The summary of results follows in Table 36:

TABLE 36

PILOT TEST SAMPLE SPECIFICATION

Pilot Test	Total	3 yrs	5 yrs	10 yrs	15 yrs	20 yrs	25 yrs	30 yrs	5 yrs w/email
Set 1 (5%) # of Companies	349	267	230	161	99	40	6	2	183
Percent of Total		77%	66%	46%	28%	11%	2%	1%	52%
Set 2 (5%) # of Companies	352	257	222	152	89	27	5	2	177
Percent of Total		73%	63%	43%	25%	8%	1%	1%	50%
Combined (10% Sample)	**701**	**524**	**452**	**313**	**188**	**67**	**11**	**4**	**360**
Percent of Total		**75%**	**64%**	**45%**	**27%**	**10%**	**2%**	**1%**	**51%**

The Survey Methodology is then defined based on *Mail and Internet Surveys: The Tailored Design Method* (2nd ed.) (Dillman, 2000, pp. 156 – 185) as follows (Appendix J):

- Week 1 -- (02/24/09) Tue 1st Contact Email Prior Letter
- Week 2 -- (02/27/09) Fr 2nd Contact Survey Cover Letter
- Week 3 -- (03/09/09) Mon 3rd Contact E-mail Thank You/Reminder
- Week 5 -- (03/23/09) Mon 4th Contact Repeat Questionnaire
- Week 10 -- (04/27/09) Mon 5th Final Contact

WebSurveyor by Vovici (available through Portland State University OIT) is used as the tool for survey distribution.

<u>Pilot Test Observations / Conclusions / Plan</u>

Six observations and four comments from the Pilot Test are used to define the plan for final Dissertation Survey implementation as follows:

Observation I:

TABLE 37

PILOT TEST COMPANIES AND COMPLETION RATE

	Total	Percent
10% Sample	701	100.00%
5 Years Plus	452	64.48%
W/ email info	360	51.36%

Test	Contacts	Unreachable	**Survey Completion**
Pilot Test 1	360	4	
Pilot Test 2	352		**7**
Pilot Test 3	344		**1**
Pilot Test 4	332	1	**5**
Pilot Test 5	324		**3**
Total		5	**16**
		1.39%	**4.44%**

Conclusions: Completion rate is within the initial estimate of expected responses of 2% - 5%. Given that solicitation is restricted to a generic email address for each company with an arbitrarily selected officer of the company as the noted contact the response rate is acceptable. A substantial loss of potential respondents is realized due to the lack of email address availability (452 companies publicly traded ≥ 5 years reduced to 360 companies publicly traded ≥ 5 years with email address = 20% loss of potential contacts).

Observation II:

NAICS Category Pilot Test Completions in order of completion:

TABLE 38

PILOT TEST NAICS CATEGORY COMPLETIONS

Date & Time Submitted	NAICS Code	Description
2/27/2009 11:11	325	Chemical Manufacturing
2/27/2009 11:56	336	Transportation Equipment Manufacturing
2/27/2009 12:06	423	Merchant Wholesalers, Durable Goods
2/27/2009 12:52	722	Food Services and Drinking Places
3/2/2009 8:14	423	Merchant Wholesalers, Durable Goods
3/2/2009 14:46	525	Funds, Trusts, and Other Financial Vehicles
3/6/2009 8:51	713	Amusement, Gambling, & Recreation Industries
3/9/2009 11:19	812	Personal and Laundry Services
3/24/2009 6:42	541	Professional, Scientific, and Technical Services
3/24/2009 11:27	541	Professional, Scientific, and Technical Services
3/26/2009 15:47	325	Chemical Manufacturing
4/1/2009 15:30	221	Utilities
4/3/2009 6:48	237	Heavy and Civil Engineering Construction
4/27/2009 17:25	311	Food Manufacturing
4/28/2009 10:56	325	Chemical Manufacturing
4/29/2009 14:26	311	Food Manufacturing

Conclusion: Participation is well represented across industries indicating that the survey is applicable across the full range of NAICS Categories.

Observation III:

Finance Related Title/Department Solicitations vs. Finance Related Title/Department Responses:

- Finance Related Solicitations: 7.25% of all solicitations
- Finance Related Rejections: 7.69% (Company Policy) of all rejections
- Finance Related Completions: 31.25% of all completions

Conclusion: A very high percentage of survey completions are from finance related title/department staff relative to the number of finance related title/department solicitations. The total percentage of finance related rejections are comparable to the percentage of finance related solicitations. Therefore -- Target Finance Related Contacts for solicitation.

Observation IV:

Several companies indicated that the survey would be forwarded to the appropriate department or person. Multiple responses from each company did not occur with the exception of one case; while statements were received from some companies that the individual noted on the cover letter does not respond to surveys.

Conclusion: Target finance related contacts when possible and delete the request for multiple responses from each company. As an additional benefit, this may result in better consistency of responses and may eliminate the need to introduce some type of averaging mechanism to address the multiple response scenarios.

Observation V:

TABLE 39

PILOT TEST FINANCIAL – NONFINANCIAL MEASURES

	Number of Measures Used			
Respondent	Financial	Operating	Employee	Customer
Finance	10	5	5	3
Finance	4	7	2	5
Finance	50	20	15	20
Corporate	20	30	5	25
Finance	10	12	6	10
Finance	4	20	2	20
Corporate	5	20	5	5
Corporate	20	20	5	10
Corporate	6	8	10	8
Corporate	20	30	15	20
Corporate	20	100	20	50
Corporate	10	3	4	3
HR	10	10	5	8
Corporate	14	15	0	3
Corporate	9	8	4	3
Max	50	100	20	50
Min	4	3	0	3
Average	14.13	20.53	6.87	12.87
Excluded first respondent as relative non- respondent all 0				

Conclusion: Good variation in ranking between categories**.**

Observation VI:

TABLE 40

PILOT TEST PROCESS SALIENCE RANKING RESPONSES

Respondent	Rank 1	Rank 2	Rank 3	Rank 4
Finance	Identity	Background	Mandated	Priority
Finance	Priority	Background	Identity	Mandated
Finance	Identity	Priority	Background	Mandated
Corporate	Mandated	Background	Identity	Priority
Finance	Priority	Background	Identity	Mandated
Finance	Identity	Background	Priority	Mandated
Corporate	Priority	Mandated	Background	Identity
Corporate	Identity	Priority	Background	Mandated
Corporate	Priority	Mandated	Background	Identity
Corporate	Background	Mandated	Priority	Identity
Corporate	Identity	Priority	Background	Mandated
Corporate	Background	Priority	Mandated	Identity
HR	Background	Mandated	Priority	Identity
Corporate	Background	Priority	Identity	Mandated
Corporate	Background	Mandated	Identity	Priority
Identity	5	0	5	5
Priority	4	5	3	3
Background	5	5	5	0
Mandated	1	5	2	7

Conclusions: There is good variability of response. The quality of question receives no written comments or questions, indicating that respondents had no problem with the survey which is therefore considered valid in its format.

Survey Comment I:

> "We are a very small biotechnology R&D company that outsources most of our operational tasks. Most of your performance questions do not pertain to our current business model."

Conclusion: This was first survey respondent whose only response was "don't know."

Solicitation was to CEO; President; Director, and completion noted Executive, Corporate, therefore target finance related contacts.

Survey Comment II:.

> "With all the junk mail going around it took me a while to verify that this request was valid. I found some phone numbers after I clicked on the link but clicking on links from unknown sources in emails is not considered safe." [Note: This comment on survey from Pilot Test 5]

Conclusion: Identify HSRRC Proposal # and HSRRC phone number on each cover letter so potential respondents can easily confirm validity of survey.

Survey Comment III:.

> "The # of estimated measures relates to the entire corporation. Of just the "Key" metrics; there are about 150-200 in total across Fin'l; Cust; Oper & Employee dimensions with many other "tracking metrics" to keep tabs on more detailed breakdowns of performance. (On Q8; I tried entering 150 but was limited to 100 by the survey). If you have further questions call [deleted for anonymity]. I would like to receive the overall results of your survey at [deleted for anonymity]. Thanks."

Conclusion: Increase maximum number available for entry to 999.

Survey Non-Respondent Email Comment IV:

> "Dear Robert,
> Being in the financial service industry especially during these economic times, it's necessary for our CEO to focus primarily on the business of increasing our stock price for our stockholders. Unfortunately, we do not have the luxury -- as we did several years ago -- to take time out of our day to complete a survey. My apologies, but unfortunately, the priority is not there right now."

Conclusion: Financial Industry turmoil at the time of the Pilot Test is documented. Once again, perhaps targeting financial contact instead of CEO or Chairman may yield better completion rate. Include the estimated 3 – 5 minutes in addition to the number of questions to highlight low time requirement on all solicitations.

Pilot Test Results Conclusions:

Pilot Test Results Conclusions are as follows. The Pilot Test is successful. Respondents understand the questions and no major flaws are detected in the study. Therefore the survey instrument can be used as in the Pilot Test. In addition the results can be combined for analysis. However, minor variations will be made in the Final Test including: 1) Note of "…brief 3 – 5 minute, 12 question questionnaire…" on all solicitation cover letters instead of the "…brief 12 question questionnaire…" comment used in the pilot test cover letters; 2) The contact noted on the email to generic address will be targeted to CFO/Accounting or some other finance related function when possible; 3) The comment regarding structure allowing multiple responses from one company will be deleted; 4) Identify HSRRC phone number and application number on every cover letter to help potential respondents confirm validity of the study.

Changes for Testing Based on Pilot Test:

The plan following the Pilot test was stated as follows: Prepare Final Test based on 50% sample rate (expected N approximately 80) using the Systematic Selection Process used in the Pilot Test. The Pilot Test selected every 10th company based on a random start number from 1 to 10 for each three digit NAICS category. The final selection will include every odd or even numbered company depending on the original random start number for the Pilot Test, excluding the previously selected companies. For example, if the original random number for a specific 3-Digit NAICS Category was 3 then the Pilot Test included companies 3, 13, 23, 33…. The final test from this NAICS 3-Digit category will include 1, _, 5, 7, 9, 11, _, 15….

Dissertation Survey Results

Results from the Pilot Test are of sufficient quality to be included with the Dissertation Survey for combined results analysis. A total of 3,578 companies are selected based on a 50% sampling of all active publicly traded companies. Of these companies, 2,217 are publicly traded for 5 years or more, of which 1,732 have email and contact information available. This comprised the sample set for survey distribution. The Survey e-mail Campaign is scheduled as follows:

- Week 1 -- (09/10/09) Th 1st Contact Email Prior Letter
- Week 2 -- (09/14/09) Mon 2nd Contact Survey Cover Letter
- Week 3 -- (09/21/09) Mon 3rd Contact E-mail Thank You/Reminder
- Week 5 -- (10/05/09) Mon 4th Contact Repeat Questionnaire
- Week 10 -- (11/09/09) Mon 5th Final Contact

The actual campaign schedule had to be modified due to a power outage resulting in the survey instrument being inaccessible for Week 5 (10/05/09), so distribution was delayed until 10/14/09 (Appendix K). Based on the number of actively traded companies in each NAICS category from which email and contact information is available a total of 64 NAICS categories are analyzed. If fewer than 3 contacts are available no testing is done (Categories 238, 483, and 711 are not analyzed due to insufficient number of contacts for dependent variable definition). 29 (45.31%) of the 64 NAICS categories included responding companies. Table 41 shows the response rate for each of the NAICS categories:

TABLE 41

NAICS CATEGORY RESPONSES

3 Digit NAICS Code	# Contacts 5 yrs w/email	Responses	Response Rate	3 Digit NAICS Code	# Contacts 5 yrs w/email	Responses	Response Rate
211	30	2	6.67%	452	6		
212	13			453	7		
213	20			454	6		
221	49	5	10.20%	481	7		
236	13			483	1		
237	9	2	22.22%	484	10		
238	2			486	9		
311	25	3	12.00%	488	4		
312	10	1	10.00%	511	59	3	5.08%
315	10			512	5		
316	7			515	12	1	8.33%
321	4			517	25		
322	12	2	16.67%	518	21		
323	6			522	221	14	6.33%
324	6			523	33		
325	158	6	3.80%	524	45	1	2.22%
326	11	1	9.09%	525	56	2	3.57%
327	4			531	9		
331	10			532	7		
332	23	1	4.35%	533	9	1	11.11%
333	54	4	7.41%	541	104	4	3.85%
334	245	8	3.27%	551	12		
335	24	1	4.17%	561	35	1	2.86%
336	34	2	5.88%	562	7	1	14.29%
337	9			611	10		
339	58	1	1.72%	621	21		
423	33	1	3.03%	622	4		
424	16			623	3		
441	7	1	14.29%	711	1		
443	3	1	33.33%	713	13	1	7.69%
445	4			721	5		
446	5			722	20	1	5.00%
448	16			812	11	2	18.18%
451	4						
Total					1732	74	

A total sample size of 76 (74 companies) is achieved compared to the expected 80 based on the Pilot Test. One respondent indicated company number 9999.999 which was the example code number and could not be identified, and one company submitted two responses as was requested in the Pilot Test. Table 42 summarizes the combined survey response results:

TABLE 42

COMBINED SURVEY RESPONSE RESULTS

Pilot Test and Dissertation Survey Contacts Setup

	Pilot	Percent	Survey	Percent	Cumulative	Percent
50% Sampling	701	100.00%	2877	100.00%	3578	100.00%
5 Years Plus	452	64.48%	1765	61.35%	2217	61.96%
W/ email contact info	360	51.36%	1372	47.69%	1732	48.41%

Dissertation Survey Notes:
4 eliminated due to insufficient contacts to define dependent variable [1372-4=1368]
8 consistently not delivered by campaign so contacts accordingly reduced [1368-8=1360]

Pilot Test Survey Results

Pilot Test	Contacts	Remove	Survey Completion	Percent of Distribution Complete	Percent of Total Contacts Complete
Pilot Test 1	360	8			
*Pilot Test 2	352	2	7	1.99%	1.94%
Pilot Test 3	344	11	1	0.29%	0.28%
Pilot Test 4	332	3	5	1.51%	1.39%
Pilot Test 5	324		3	0.93%	0.83%
Total		24	16		4.44%
*6 companies completed		6.67%			

Dissertation Survey Results

Dissertation Survey	Contacts	Remove	Survey Completion	Percent of Distribution Complete	Percent of Total Contacts Complete
Dissertation Survey 1	1360	7			
Dissertation Survey 2	1353	10	28	2.07%	2.06%
Dissertation Survey 3	1315	13	16	1.22%	1.18%
**Dissertation Survey 4	1286	19	12	0.93%	0.88%
***Dissertation Survey 5	1256		4	0.32%	0.29%
Total		49	60		4.41%

**Distribution delayed 9 days - one completed as code 9999.999 not usable
***SSL Server went down several hours day of distribution, one message from contact security not good

Cumulative Survey Results

Dissertation Survey	Contacts	Remove	Survey Completion	Percent of Distribution Complete	Percent of Total Contacts Complete
Cumulative 1	1720	15	0	0	0
Cumulative 2	1705	12	35	2.05%	2.03%
Cumulative 3	1659	24	17	1.02%	0.99%
Cumulative 4	1618	22	17	1.05%	0.99%
Cumulative 5	1580	0	7	0.44%	0.41%
Total Cumulative		73	76		4.42%
		4.24%			

Responses to the Survey are documented (Appendix L) by ID as chronologically submitted (1 – 76).

Hypothesis Testing

The dependent variable is the 12-month rolling average stock price comparisons of 1/05 vs. 1/09 for all sample companies in each of the 29 responding NAICS categories (1,288 companies with data available). The begin date of 1/05 for the comparison date range requires that every company is publicly traded for ≥ 5 years since only companies for which monthly stock price history is available as of 2/2/04 are included (1/05 result is monthly average of 2/2/04 to 1/3/05 and the comparison 1/09 result is monthly average of 2/1/08 to 1/2/09; data range for each company is therefore February 2004 through January 2009).

Appendix M shows the years the companies are publicly traded and percentage change for all sample companies in the NAICS categories with responses. Data are sorted by: 1) NAICS 3-Digit Code; 2) Percent Change in Stock Price One-Year Rolling Average from 1/05 to 1/09. Each 3-Digit NAICS category is segmented into thirds to define low, medium and high performers. Respondent companies are highlighted and pilot test solicitations are noted. The methodology is demonstrated for NAICS Code 211 in Table 43 as follows:

TABLE 43

DEPENDENT VARIABLE DEFINITION NAICS CATEGORY 211

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	211	060	6.8	-66.05		L					
	211	080	13.3	-64.15							
	211	134	8.5	-55.52							
	211	142	14.1	-46.47							
	211	160	16.8	-27.46							
	211	076	7.6	-21.95							
P	211	098	13.3	-18.97							
	211	162	8.5	-7.82							
P	211	048	15.2	22.58							
	211	114	11.9	37.44	10						
	211	010	11.9	38.72							
	211	126	11.3	39.12							
	211	166	20.9	62.58							
	211	004	11.9	66.13							
	211	154	17.4	73.52							
	211	146	16.0	100.01		M					
P	211	168	11.9	106.04							
	211	022	21.4	110.51							
P	211	128	6.0	111.10							
P	211	008	27.0	134.68	10						
	211	136	16.8	139.27							
P	211	038	18.8	149.23							
P	211	118	14.8	160.45							
	211	112	26.9	166.54							
	211	034	15.8	166.75							
P	211	028	18.8	225.60							
	211	064	19.2	241.53							
	211	082	21.0	249.68							
	211	090	6.9	530.01							
	211	040	9.2	837.52	10		30	115.35	183.42	837.52	-66.05
	221	047	5.2	-74.24							

This analysis also is performed based on "responding companies only" (Appendix N) for comparison of respondent performance rankings with and without the standardization based on NAICS 3-Digit Category as follows:

TABLE 44

DEPENDENT VARIABLE DEFINITION

Pilot	NAICS Code	Co. No.	NAICS 1/05 - 1/09	Responding 1/05 - 1/09
	211	060	L	L
	211	146	M	H
	221	001	L	L
	221	049	L	M
	221	101	H	H
P	221	105	M	H
	221	141	M	H
P	237	001	M	M
	237	027	L	L
P	311	038	H	H
P	311	058	L	L
	311	084	L	M
	312	033	L	L
	322	006	CHAPTER 11	
	322	026	H	H
	325	035	L	L
P	325	153	L	L
	325	277	M	M
P	325	303	H	M
	325	449	H	H
P	325	453	M	L
	326	036	H	H
	332	007	L	M
	333	070	H	H
	333	104	L	M
	333	130	L	L
	333	146	M	H
	334	131	H	M
	334	191	H	H
	334	229	N/A FOR DATA RANGE	
	334	421	H	H
	334	439	M	L
	334	477	H	M
	334	499	M	L
	334	601	M	L
	335	009	M	H
P	336	048	M	M
	336	074	H	H

Pilot	NAICS Code	Co. No.	NAICS 1/05 - 1/09	Responding 1/05 - 1/09
	339	087	M	M
P	423	135	M	M
	441	025	L	L
	443	006	M	M
	511	005	M	M
	511	019	M	M
	511	159	M	M
	515	009	M	L
	522	135	H	H
	522	199	H	H
	522	233	H	M
	522	315	L	L
	522	319	H	M
	522	337	M	L
	522	349	H	M
	522	359	H	H
	522	417	H	M
	522	449	L	L
	522	499	M	L
	522	625	L	L
	522	659	M	M
	522	679	H	M
	524	074	H	H
P	525	475	H	H
	525	791	H	H
	533	016	H	H
	541	018	L	L
P	541	052	L	L
	541	150	M	M
P	541	352	H	H
	561	078	M	M
	562	030	M	L
P	713	039	L	L
P	722	054	L	L
P	812	006	H	H
	812	028	H	H

Count		NAICS 1/05 - 1/09	Responding 1/05 - 1/09
	H	27	24
	M	25	24
	L	20	24

IBM SPSS Statistics GradPack 18 Windows (PASW Statistics GradPack) is used for testing.

Prior to Hypothesis testing four responses are deleted as follows relative to Respondent IDs noted in Appendix L: ID 1) No responses; ID 27) Unable to define Dependent Variable due to Chapter 11 filing; ID 70) Respondent used Company Code 9999.999, unable to identify company; and ID 72) Unable to define Dependent Variable, "Not Available for Data Range" message when attempting to download stock price histories. Data with these modifications is used for the Pre-Adjustment Results for each hypothesis.

Two responses are received from Company Code 4230.135: ID 3 Front Line Supervisor; and ID 5 Executive. The Executive position is typical of other company respondents, but to assure that results are not skewed based on this double company entry tests are performed based on: 1) Inclusion of both responses for this company identified as "Total Results"; 2) Inclusion of Executive response only for this company identified as "Executive Results"; and 3) Inclusion of Front Line Supervisor response only for this company identified as "Supervisor Results." Data is adjusted and is defined for each hypothesis to remove non-responses relative to the specific hypothesis in question. Results for each hypothesis are presented as: 1) Stated Hypothesis; 2) Pre-Adjustment results; 3) Description of the adjustments made for the specific hypothesis; 4) Total Results; 5) Executive Results; then 6) Supervisor Results followed by conclusions.

Hypothesis 1 Test:

H_1: Salience of business processes identified for measurement correlate to firm value as tested by Kruskal-Wallis one-way ANOVA.

Prior to performing this test, data is transposed from Columns as rank 1, 2, 3, 4 with Row inputs Identity (I), Priority (P), Background (B), Mandated (M) to Columns as I, P, B, M and Rows as rank 1, 2, 3, 4:

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Identity Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.601	Retain the null hypothesis.
2	The distribution of Priority Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.659	Retain the null hypothesis.
3	The distribution of Background Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.961	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 9: H_1 Pre-Adjustment Results

H_1 Adjustments

H_1 Test Data: Delete ID 28 No response.

H_1 Executive: Delete ID 3 Supervisor.

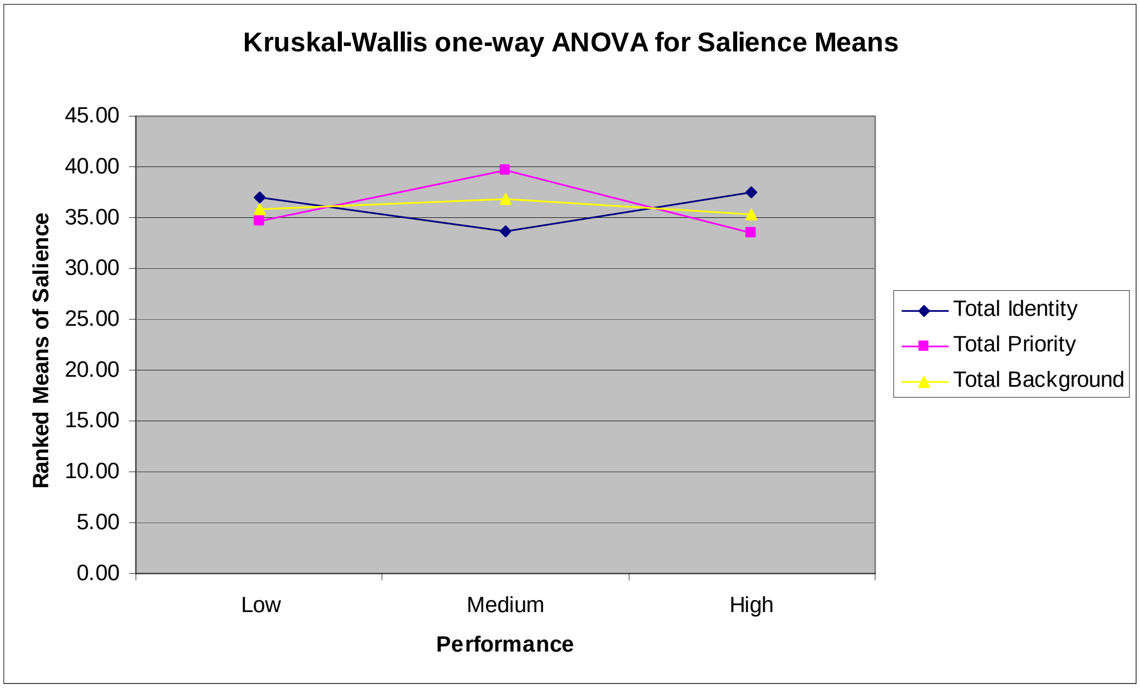
H_1 Supervisor: Delete ID 5 Executive.

Include Partial responses ID 69 and ID 75 -- assign both priority rank = 5 for missing rankings based on logic that non-use ranks lower in priority than the defined lowest rank (Appendix O).

TABLE 45

H_1 KRUSKAL-WALLIS MEANS

	Low	Medium	High
Total Identity	37.00	33.60	37.52
Total Priority	34.66	39.68	33.54
Total Background	35.84	36.86	35.31
	Low	Medium	High
Executive Identity	36.47	33.04	37.00
Executive Priority	33.79	40.00	32.70
Executive Background	35.29	36.46	34.80
	Low	Medium	High
Supervisor Identity	36.47	33.04	37.00
Supervisor Priority	34.61	38.46	33.50
Supervisor Background	35.29	36.46	34.8

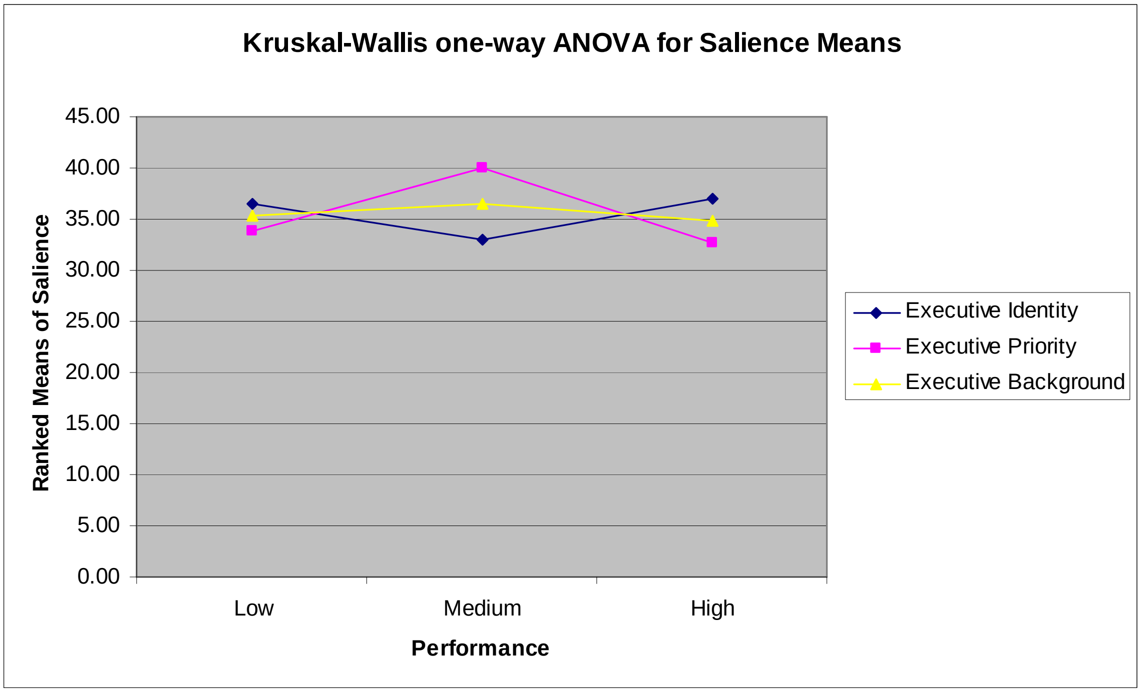


Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Identity Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.752	Retain the null hypothesis.
2	The distribution of Priority Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.503	Retain the null hypothesis.
3	The distribution of Background Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.961	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

<u>Figure 10:</u> H_1 Total Results

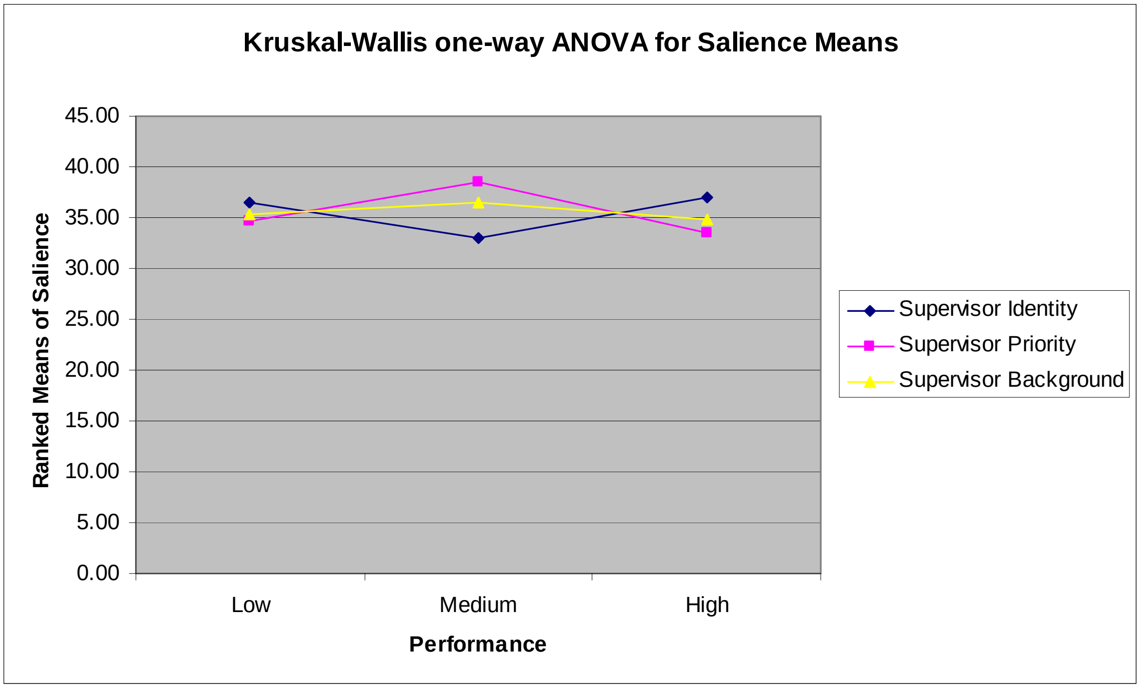


Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Identity Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.747	Retain the null hypothesis.
2	The distribution of Priority Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.371	Retain the null hypothesis.
3	The distribution of Background Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.954	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 11: H_1 Executive Results



Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Identity Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.747	Retain the null hypothesis.
2	The distribution of Priority Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.644	Retain the null hypothesis.
3	The distribution of Background Process Rank is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.954	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

<u>Figure 12:</u> H_1 Supervisor Results

H_{1a}: Identity business processes using the means results from H_1 have a higher positive correlation to firm value than Priority business processes as tested by the Chi-Square Contingency Test of Association.

TABLE 46

H_{1a} CHI-SQUARE CONTINGENCY TEST IDENTITY VS PRIORITY

Process * Performance Crosstabulation

Count

		Performance 1H	Performance 2M	Performance 3L	Total
Process	I	38	34	37	109
	P	34	40	35	109
Total		72	74	72	218

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.764[a]	2	.682
Likelihood Ratio	.765	2	.682
N of Valid Cases	218		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 36.00.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Contingency Coefficient	.059	.682
N of Valid Cases		218	

H_{1b}: Priority business processes using the means results from H_1 have a higher positive correlation to firm value than Background business processes as tested by the Chi-Square Contingency Test of Association.

TABLE 47

H_{1b} CHI-SQUARE CONTINGENCY TEST PRIORITY VS BACKGROUND

Process * Performance Crosstabulation

Count

		Performance			Total
		1H	2M	3L	
Process	B	35	37	36	108
	P	34	40	35	109
Total		69	77	71	217

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.141[a]	2	.932
Likelihood Ratio	.141	2	.932
N of Valid Cases	217		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 34.34.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Contingency Coefficient	.025	.932
N of Valid Cases		217	

H_1 Conclusions:

Results of this test are not statistically significant and do not support the hypothesis that salience of business processes identified for measurement correlate to firm value. For this test, the respondent Ranks (rates) from 1 most important to 4 least important process types related to performance measures used, so lower mean ranking in this study indicates higher perceived importance of process types related to performance measures. High performers and low performers rank the processes similarly with priority processes ranking highest, followed by background and then identity processes. Medium performers rank identity processes highest followed by background and then priority processes. Results for the two sub hypotheses H_{1a} and H_{1b} also are not significant at 0.05.

Hypothesis 2 Test:

H_2: Nonfinancial performance measures are more correlated to firm value than financial measures as tested by Kruskal-Wallis one-way ANOVA.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Financial Measures is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.077	Retain the null hypothesis.
2	The distribution of Non-Financial Measures is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.004	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 13: H_2 **Pre-Adjustment Results**

H_2 Adjustments

H_2 Test Data: Delete ID 17 and ID 50 No responses.

H_2 Executive: Delete ID 3 Supervisor.

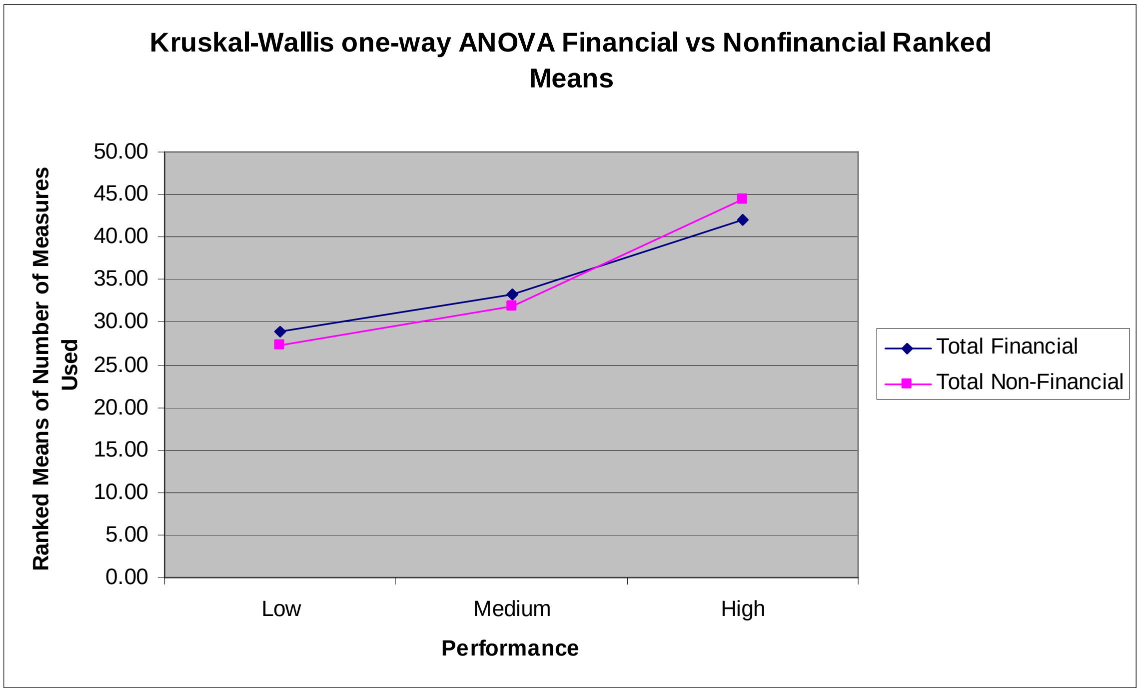
H_2 Supervisor: Delete ID 5 Executive.

Include non response from ID 51 for nonfinancial since financial is used.

TABLE 48

H_2 KRUSKAL-WALLIS MEANS

	Low	Medium	High
Total Financial	28.86	33.20	42.06
Total Nonfinancial	27.33	31.80	44.37
	Low	Medium	High
Executive Financial	28.03	33.40	41.07
Executive Nonfinancial	26.86	31.54	43.50
	Low	Medium	High
Supervisor Financial	28.69	32.08	41.80
Supervisor Nonfinancial	27.28	30.50	44.15

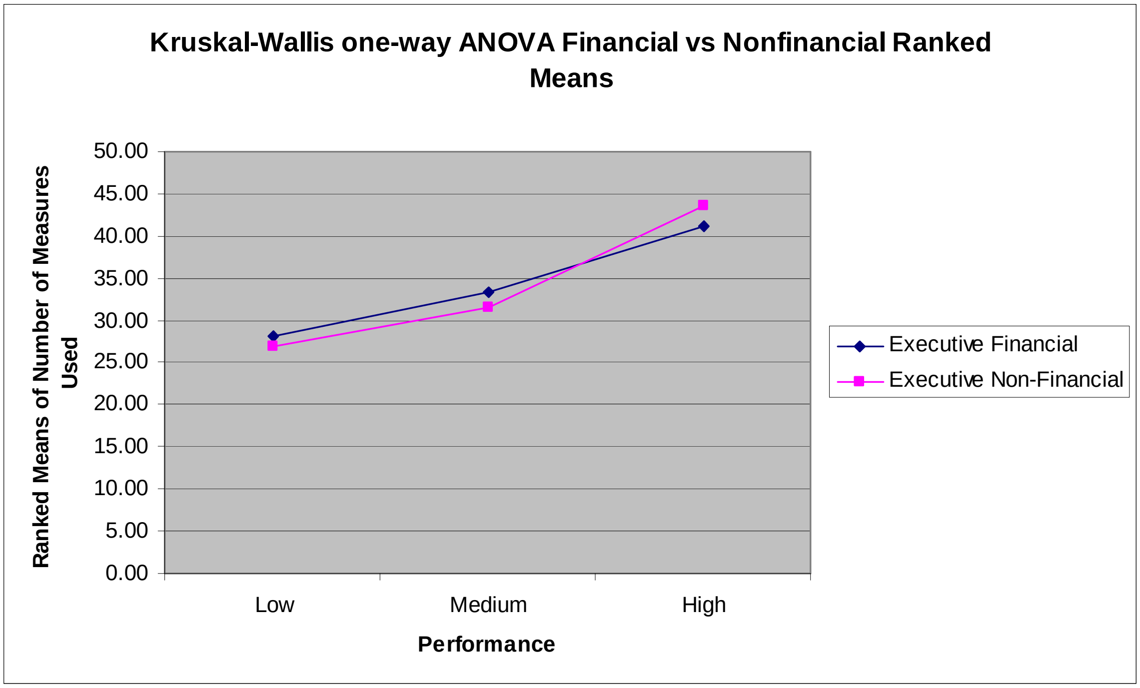


Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Financial Measures is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.077	Retain the null hypothesis.
2	The distribution of Non-Financial Measures is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.012	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 14: H_2 Total Results

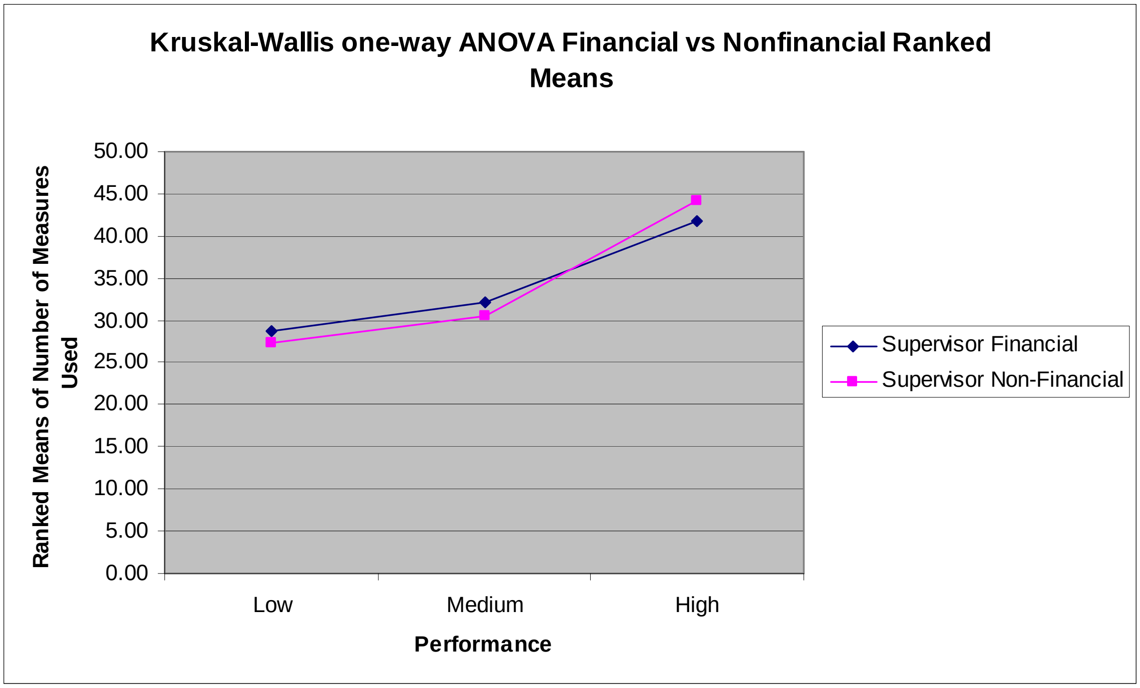


Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Financial Measures is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.087	Retain the null hypothesis.
2	The distribution of Non-Financial Measures is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.014	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

<u>Figure 15</u>: H_2 Executive Results



Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Financial Measures is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.065	Retain the null hypothesis.
2	The distribution of Non-Financial Measures is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.009	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

<u>Figure 16</u>: H_2 Supervisor Results

H_2 Conclusions:

High performers show greatest utilization of both financial and nonfinancial measures, followed by medium performers, with low performers utilizing both measures the least. Nonfinancial performance measures are more correlated to firm value than financial measures with the high performers' mean score for nonfinancial measures being higher than for financial measures. By contrast, medium and low performers exhibit the opposite: higher mean scores for financial measures than for nonfinancial measures. **Rejection of the null hypothesis results support the hypothesis that nonfinancial performance measures are more correlated to firm value than financial measures and are statistically significant at 0.05 for nonfinancial measures, at 0.09 for financial measures.**

Hypothesis 3 Test:

H_3: The relative importance of nonfinancial performance measures compared to financial measures using the results from H_2 is greater in high clock-speed industries than in low clock-speed industries as tested by Cramer's Phi.

For this test it is first necessary as noted in Chapter IV to calculate the Kruskal-Wallis one-way ANOVA ranked means from H_2 then reorganize based on three categories: 1) Product; 2) Process; and 3) Performance Measurement System clockspeed (Appendix P). Cramer's Phi is then calculated to find the strength of association for Performance vs. Financial/Nonfinancial Measurement in High, Medium and Low clockspeeds for each of the 3 categories. This test is performed on Total Results (Appendix Q) as summarized on Table 49:

TABLE 49

H_3 CRAMER'S PHI BY CLOCKSPEED

Chi-square & Cramers Phi (V)			
Clockspeed	Product	Process	Performance Measurement System
High φc	0.10	0.06	0.16
High $\chi 2$	0.424	0.184	0.812
Medium φc	0.31	0.24	0.19
Medium $\chi 2$	1.227	1.027	1.024
Low φc	0.51	#DIV/0!	0.53
Low $\chi 2$	2.339	#DIV/0!	1.404
Retain the null hypothesis			
Significance	df = 2	0.1	0.05
Required $\chi 2$		4.605	5.991

H3 is not supported by the evidence. Though lacking statistical significance at 0.05, greater strength of association for Performance vs. Financial/Nonfinancial Measurement is exhibited in low clockspeed systems identified by respondents than in high clockspeed systems.

Hypothesis 4 Test:

H_4: The number of categories of Balanced Scorecard metrics used correlate to firm value as tested by Kruskal-Wallis one-way ANOVA.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of BSC Used is the same across categories of 1H,2M, 3L Rank.	Independent-Samples Kruskal-Wallis Test	.009	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 17: H_4 **Pre-Adjustment Results**

H_4 Adjustments

H4 Test Data: Delete ID 17 and ID 50 no responses.

H4 Executive: Delete ID 3 Supervisor.

H4 Supervisor: Delete ID 5 Executive.

Responses for this test are summarized in Appendix R. Of the nine companies using less than the full four categories of measurement (eleven companies including the two non-response companies), a disproportionate percentage are low performers as can be seen in Table 50:

TABLE 50

BALANCED SCORECARD CATEGORY UTILIZATION

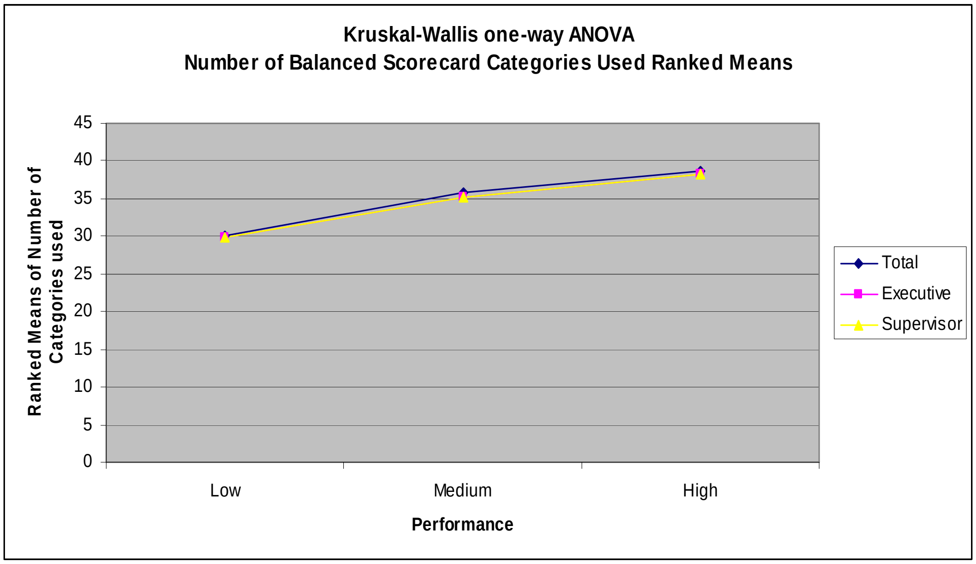
	Total Reporting Respondents	Respondents Reporting <4 Categories	% of Respondents by Performance Category Reporting <4 Categories	% of Respondents Reporting <4 Categories
High	27	1	4%	11%
Medium	25	3	12%	33%
Low	20	5	25%	56%

Balanced Scorecard				
Categories Used	Performance			
	Low	Medium	High	
4	13	22	26	
3	3	2	1	
2	1	1		
1	1			p = 0.06
0	2			p = 0.009
Total	20	25	27	

TABLE 51

BALANCED SCORECARD KRUSKAL-WALLIS MEANS

	Low	Medium	High
Mean Scores	30.17	35.82	38.76
Executive	29.81	35.21	38.28
Supervisor	29.81	35.21	38.28



Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of BSC Used is the same across categories of 1H,2M, 3L Rank.	Independent-Samples Kruskal-Wallis Test	.057	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .06.

Figure 18: H_4 Total Results

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of BSC Used is the same across categories of 1H,2M, 3L Rank.	Independent-Samples Kruskal-Wallis Test	.059	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .06.

Figure 19: H_4 Executive & Supervisor Results

H_4 Conclusions:

Rejection of the null hypothesis results of this test support the hypothesis that the number of categories of balanced scorecard metrics used correlate to firm value at a 0.06 level of significance. The high level of significance in the Pre-Adjustment Results is due to the inclusion of non-responders ID 17 and ID 50 who are both low performers. The results of this test would support the hypothesis at a high level of significance with the assumption that non-usage of any category of balanced scorecard by these two respondents is valid.

CHAPTER VI

DISCUSSION

This chapter presents: 1) Discussion of results and implications of the research; 2) Limitations of the research; 3) Strengths of the research; then 4) Suggestions for further research.

Results and Implications

H_1: Salience of Business Process

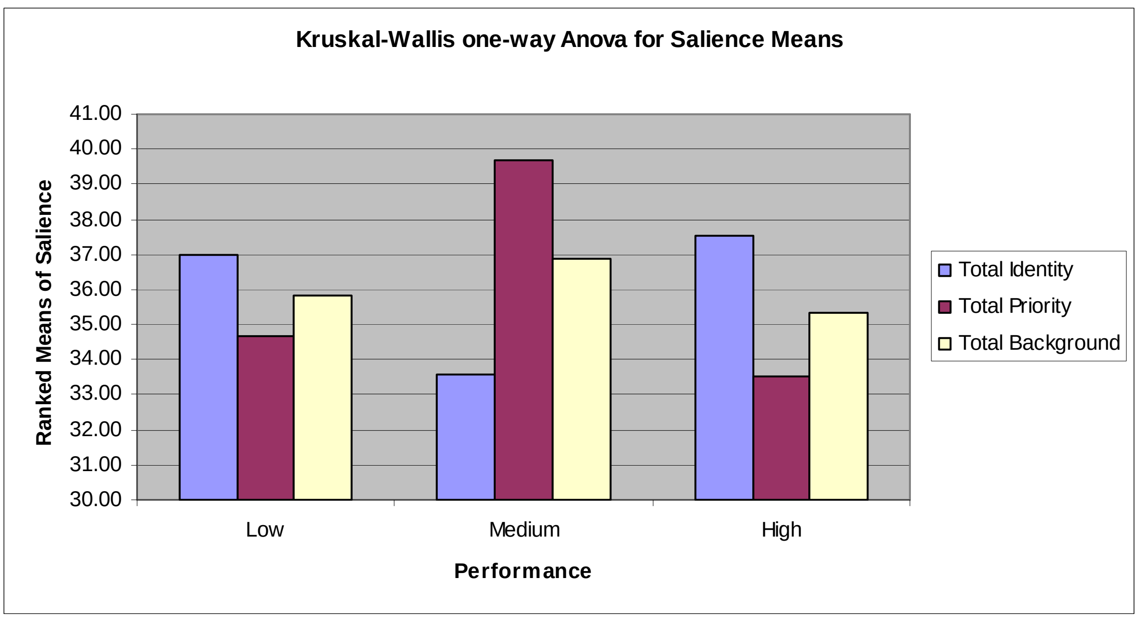


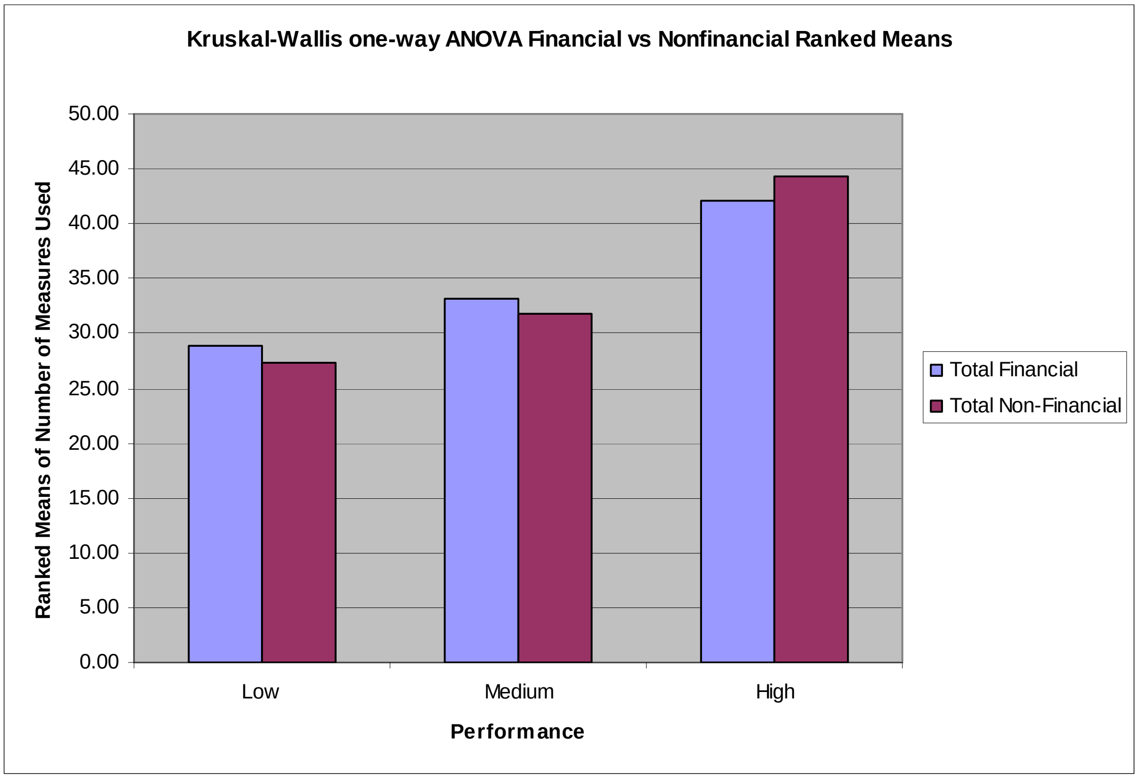
Figure 20: Process Salience Usage by Performance

The rankings in this test are rated based on 1 most important to 4 least important process types related to performance measures used, so lower mean ranking in this study indicates higher perceived importance of process types related to performance measures.

It is hypothesized that: 1) High performers prioritize identity processes as most important, followed by priority processes then background processes; 2) Low performers prioritize background processes as most important, followed by priority processes then identity processes; and 3) Medium performers fall somewhere in the middle of the two extremes. The pattern uncovered, though not statistically significant, is that high performers and low performers rank similarly with greatest importance placed on priority processes followed by background processes then identity processes, while medium performers place most importance on identity processes followed by background then priority processes. High, medium and low performers all rate background processes in the middle of their importance rankings. In addition to the lack of statistical significance, the following section on limitations notes that reliability of this specific test also is not high. Given the lack of statistical significance and reliability valid inference cannot be made from the results of this test.

$\underline{H_2\text{: Financial vs. Nonfinancial Performance Measures}}$

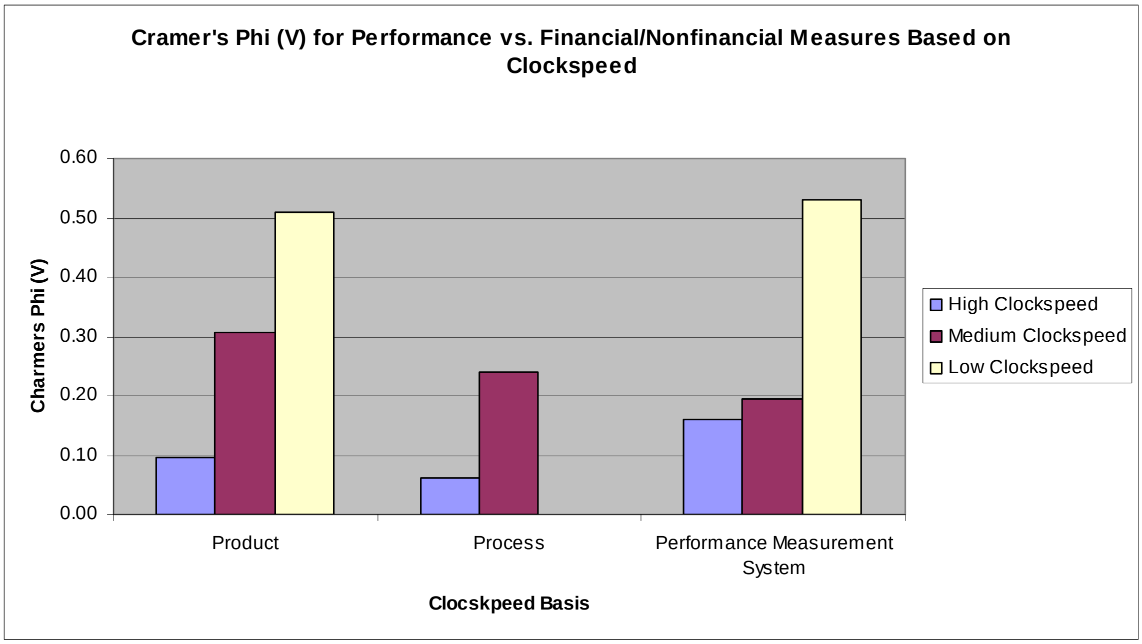
A number of studies, including Chow and Van der Stede (2006), suggest that nonfinancial measures are better than financial measures for improving performance because financial measures are lagging indicators, but "…little empirical evidence is available on the relation between nonfinancial measures and financial performance" (Banker, Potter & Srinivasan, 2000, p. 65). Ittner and Larker (2003) find that few companies realize the benefits of nonfinancial performance measures because they: 1) Don't link measures to strategy; 2) Don't validate the links between nonfinancial performance measures and future financial results; 3) Don't set the right performance targets; or 4) Employ metrics that lack statistical validity. They further note that "outstanding" nonfinancial performance often produces diminishing or even negative economic returns (p. 5).



<u>Figure 21:</u> Ranked Means of Financial and Nonfinancial Measures Used by Performance

This study provides statistically significant empirical evidence that high performing companies rank higher in utilization of nonfinancial measures than do medium or low performing companies. This result is obtained blind to the specific measures used, linkage between measures and strategy, or statistical validity of the measures used. For practitioners it can be inferred that benefit is derived from greater usage of both financial and nonfinancial measures, with the greatest benefit derived from use of nonfinancial measures. For researchers, further study regarding specific measurements, statistical validity of the measurements, and linkages between selected measurements and strategy may provide value.

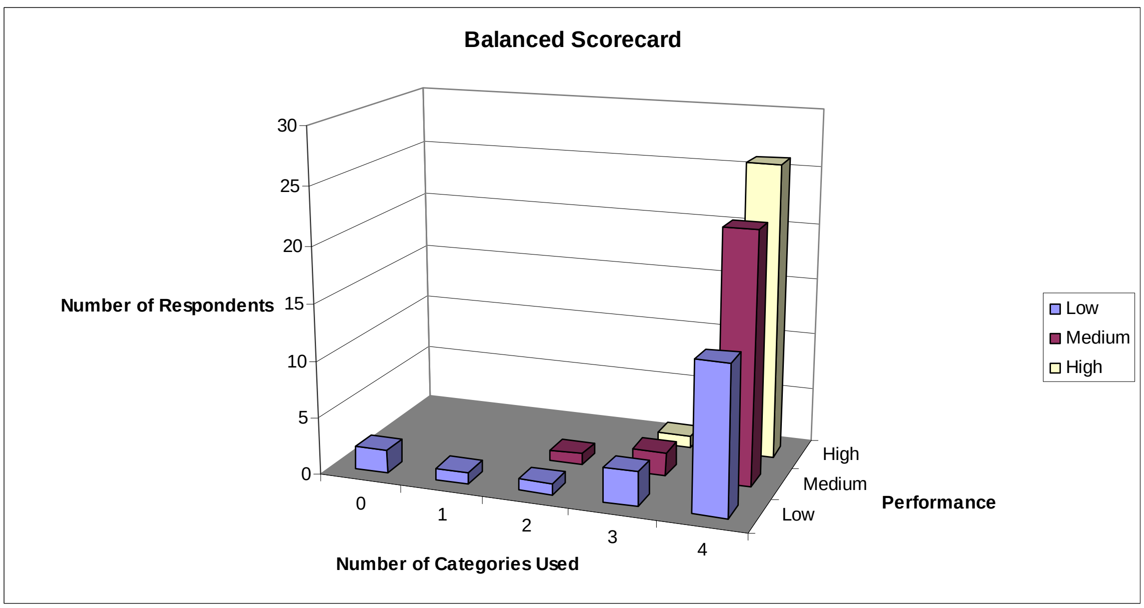
<u>H_3: Financial / Nonfinancial Measures Relative to Clockspeed</u>



<u>Figure 22:</u> Cramer's Phi (V) Based on Clockspeed

It is hypothesized that the relative importance of nonfinancial performance measures compared to Financial measures using the results from H_2 is greater in high clockspeed industries than in low clockspeed industries as tested by Cramer's Phi based on the logic that nonfinancial performance measures result in shorter lag periods of feedback than financial performance measures, and the relative importance of the lag time will be heightened in higher clockspeed industries as defined by Fine (1998); with higher clockspeed industries being more susceptible to dynamic archetypes associated with delayed feedback (Senge,1990; Sterman, 2000). Cramer's Phi (V) values in this test are counter to that anticipated with greater strengths of association for Performance vs. Financial/Nonfinancial Measurement exhibited in low clockspeed industries than in high clockspeed industries. In all cases, however, χ^2 is far below the 5.991 required for statistical significance at a 0.05 level with 2 degrees of freedom (Appendix Q). Due to the lack of statistical significance valid inference cannot be made from the results of this test.

<u>H_4: Balanced Scorecard Category Metrics Used</u>



<u>Figure 23:</u> Balanced Scorecard Utilization by Performance Category

Figure 23 highlights the decreasing utilization of the full spectrum of balanced scorecard category metrics by medium and low performing companies relative to high performing companies in this test. Going from high performers to low performers the number of respondents decreases while the number of companies reporting usage of fewer that the full 4 categories available increases. It also demonstrates that of the companies using fewer than the full four possible balanced scorecard category metrics, the high performing company reports using 3 of the 4 categories while the low performing companies report as few as 1 category used. As noted in Chapter V, two low performing companies also report no measurements from any of the categories available, inclusion of which would have resulted in a 0.009 level of significance.

Osama (2006) finds only anecdotal improvements based on implementation of individual elements of the Balanced Scorecard (p. ix). Neelly, Kennerley and Martinez (2004) note a paucity of empirical evidence exploring the impact of balanced scorecard and suggest a need for further research into the performance impact of balanced scorecards. Ittner and Larker (2003), while commenting on the lack of benefits derived from using nonfinancial measures note middle managers perceive the balanced scorecard as a “four bucket” or “smorgasbord” approach because the four perspectives are imposed by upper management regardless of the business unit’s strategy or objectives, and Bourne, Kennerley and Franco-Santos (2005) find that high performing business unit managers simply use the scorecard data to check their own assumptions.

This study provides statistically significant (0.06 level) empirical evidence that utilization of performance measures across the four categories of balanced scorecard metrics correlates to higher performance. This result is observed with no information regarding implementation of the balanced scorecard methodology. For practitioners it can be inferred that benefit is derived from defining and using measurement metrics from each of the four categories. For researchers, further study regarding implementation relative to business units' strategy and objectives may provide value.

Limitations

Ittner, Larker and Meyer (2003) note the issue of weights placed by managers on the importance of measures that are used. Weighting in this study is based on the number of measures defined by the respondents, so there is no assurance that the "number of measures" in any category defined by respondents reflects the weight placed on the value of those measures by managers for decision making. In addition, the dependent variable is based on stock price so non-publicly traded companies are not represented in the test.

Potential for bias exists in the test due to insufficient: Construct Validity; Internal Validity; External Validity; and/or Reliability. Each is addressed relative to the countermeasures that are proposed in Chapter IV.

Construct Validity:

Construct Validity asks whether what is measured is what is wanted to be measured. "The major threats to construct validity are those created by bias either through the process of observing itself, or bias introduced by the observation method" (Atkinson & Shafir, 1998, p. 60).

The potential for introduction of bias by the observation method or process of observing is mitigated with the Survey Consent Form (Appendix S), that identifies the subject matter of the research, the mode of observation, and the background training taken into the study.

Internal Validity:

Internal Validity: "…asks whether the researcher has taken steps to ensure that the evidence used to infer a casual [*sic*] relationship is complete. That is… [to] avoid reporting a spurious correlation as causal" (Atkinson & Shafir, 1998, p. 61).

The theoretic basis of the proposed correlation is defined in Chapter III -- Description of the Problem. Tests for correlation between different variables have been performed to confirm that there is little chance that test results are spurious correlation. Non-scale variables are tested for correlation using Kruskal-Wallis one-way ANOVA, scale relationships are tested for Bilateral Correlation.

Performance relative to: Clockspeed (Product Change, Process Change, and Perf. Measure Change); Asset Size; and Age are analyzed. None test significant for correlation with Kruskal-Wallis one-way ANOVA as shown in Figure 24:

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Product Change (1, 2, 3) is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.966	Retain the null hypothesis.
2	The distribution of Process Change is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.300	Retain the null hypothesis.
3	The distribution of Perf. Measure Change is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.452	Retain the null hypothesis.
4	The distribution of Asset Size (thousands) is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.570	Retain the null hypothesis.
5	The distribution of Age (yrs as of 12/08) is the same across categories of 1H,2M,3L Rank.	Independent-Samples Kruskal-Wallis Test	.172	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

<u>Figure 24:</u> Performance Relative to Clockspeed, Asset Size and Age

Position relative to: Financial Measures; Nonfinancial Measures; Balanced Scorecard Categories used (BSC); Identity Process rank; Priority Process Rank; and Background Process Rank are analyzed. None test significant for correlation with Kruskal-Wallis one-way ANOVA as shown in Figures 25:

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Financial Measures is the same across categories of Position.	Independent-Samples Kruskal-Wallis Test	.199	Retain the null hypothesis.
2	The distribution of Non-Financial Measures is the same across categories of Position.	Independent-Samples Kruskal-Wallis Test	.410	Retain the null hypothesis.
3	The distribution of BSC Used is the same across categories of Position.	Independent-Samples Kruskal-Wallis Test	.909	Retain the null hypothesis.
4	The distribution of Identity Process Rank is the same across categories of Position.	Independent-Samples Kruskal-Wallis Test	.858	Retain the null hypothesis.
5	The distribution of Priority Process Rank is the same across categories of Position.	Independent-Samples Kruskal-Wallis Test	.611	Retain the null hypothesis.
6	The distribution of Background Process Rank is the same across categories of Position.	Independent-Samples Kruskal-Wallis Test	.460	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

<u>Figure 25:</u> Correlations Relative to Position

Department relative to: Financial Measures; Nonfinancial Measures; Balanced Scorecard Categories used; Identity Process rank; Priority Process Rank; and Background Process Rank are analyzed. None test significant for correlation with Kruskal-Wallis one-way ANOVA as shown in Figures 26:

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Financial Measures is the same across categories of Deparment.	Independent-Samples Kruskal-Wallis Test	.485	Retain the null hypothesis.
2	The distribution of Non-Financial Measures is the same across categories of Deparment.	Independent-Samples Kruskal-Wallis Test	.462	Retain the null hypothesis.
3	The distribution of BSC Used is the same across categories of Deparment.	Independent-Samples Kruskal-Wallis Test	.142	Retain the null hypothesis.
4	The distribution of Identity Process Rank is the same across categories of Deparment.	Independent-Samples Kruskal-Wallis Test	.253	Retain the null hypothesis.
5	The distribution of Priority Process Rank is the same across categories of Deparment.	Independent-Samples Kruskal-Wallis Test	.666	Retain the null hypothesis.
6	The distribution of Background Process Rank is the same across categories of Deparment.	Independent-Samples Kruskal-Wallis Test	.154	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 26: Correlations Relative to Department

Bilateral Correlation between: Financial Measures; Nonfinancial Measures; Clockspeed (Product Change, Process Change, and Perf. Measure Change); Balanced Scorecard Categories used (BSC Used); Asset Size; and Age shown in Table 52:

TABLE 52

BILATERAL CORRELATIONS

		Financial Measures	Non-Financial Measures	Product Change (1, 2, 3)	Process Change	Perf. Measure Change	BSC Used	Asset Size (thousands)	Age (yrs as of 12/08)
Financial Measures	Pearson Correlation	1	.867**	.217	-.147	-.175	.049	-.002	.107
	Sig. (2-tailed)		.000	.075	.229	.166	.684	.985	.376
	N	70	70	68	69	64	70	66	70
Non-Financial Measures	Pearson Correlation	.867**	1	.192	-.103	-.272*	.162	.122	.156
	Sig. (2-tailed)	.000		.111	.392	.027	.174	.322	.192
	N	70	72	70	71	66	72	68	72
Product Change (1, 2, 3)	Pearson Correlation	.217	.192	1	.480**	.176	-.041	.209	.173
	Sig. (2-tailed)	.075	.111		.000	.162	.736	.092	.153
	N	68	70	70	69	65	70	66	70
Process Change	Pearson Correlation	-.147	-.103	.480**	1	.189	-.182	.097	-.054
	Sig. (2-tailed)	.229	.392	.000		.129	.129	.435	.655
	N	69	71	69	71	66	71	67	71
Perf. Measure Change	Pearson Correlation	-.175	-.272*	.176	.189	1	-.175	-.181	.004
	Sig. (2-tailed)	.166	.027	.162	.129		.159	.159	.973
	N	64	66	65	66	66	66	62	66
BSC Used	Pearson Correlation	.049	.162	-.041	-.182	-.175	1	.024	.054
	Sig. (2-tailed)	.684	.174	.736	.129	.159		.845	.651
	N	70	72	70	71	66	72	68	72
Asset Size (thousands)	Pearson Correlation	-.002	.122	.209	.097	-.181	.024	1	.366**
	Sig. (2-tailed)	.985	.322	.092	.435	.159	.845		.002
	N	66	68	66	67	62	68	68	68
Age (yrs as of 12/08)	Pearson Correlation	.107	.156	.173	-.054	.004	.054	.366**	1
	Sig. (2-tailed)	.376	.192	.153	.655	.973	.651	.002	
	N	70	72	70	71	66	72	68	72

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Significant correlations are noted as follows:

> Nonfinancial Measures relative to Financial Measures with a Pearson's r of 0.867. Though this correlation is significant at the 0.01 level, similarities and differences in utilization of the two types of measurement based on level of performance are documented in H_2.
>
> Process Change rate relative to Product Change rate (clockspeed) with a Pearson's r of 0.480 at a 0.01 level. Correlation between these two is logical, significant, and suggested by Carillo (2005) and Mendelson and Pillai (1999), but has no bearing on hypothesis tests that were performed.
>
> Performance Measure Change rate relative to Nonfinancial Measures with a Pearson's r of -0.272. Though significant at the 0.05 level, this is not a strong correlation and does not have a causal relationship to any of the hypothesis tests that are performed.

External Validity:

External Validity: Asks whether the population is clearly identified in order to apply the testing results (Atkinson & Shafir, 1998, p. 61).

The definition of the subject population and the means of selection are defined in Chapter IV -- Methods and Techniques. The sample solicited by email to participate in the web based survey is large and representative: 1) Sample is drawn from 100% of active publicly traded companies downloaded from Mergent Online in 3 Digit NAICS categories; 2) A random number generator is used to define the start number for each 3 digit NAICS Category; 3) A systematic selection of every odd or even numbered company depending on random number for each NAICS category for a 50% sample (3,578 companies total) is used; and 4) All companies traded ≥5 yrs with email address available (1,732 companies total) in the 50% sampling are used.

Reliability:

Reliability: "…asks whether the research can be replicated with the same results" (Atkinson & Shafir, 1998, p. 62). This research encompasses a large number of industries with results standardized by industry (NAICS Code) over the same time period (end date of financial comparison is defined and identical for all subjects).

The following methods are proposed in Chapter IV to test reliability of the survey instrument: 1) Testing Pilot survey questionnaire, 2) Review demographics of non-respondents vs. respondents (size, performance, NAICS category, longevity) to test non-response bias, 3) Perform Split-Half reliability test, and 4) Review consistency among organization level responses relative to department and staff position. Results for each follow:

1) The Pilot Test tests the questionnaire with no noted issues from respondents as documented in Chapter V -- Pilot Test Observations / Conclusions / Plan.

2) Review demographics of non-respondents vs. respondents (size, performance, NAICS category, longevity) to test non-response bias. Respondents are representative of the sample population as follows in Table 53:

TABLE 53

DEMOGRAPHICS OF RESPONDENTS VS. NONRESPONDENTS

29 of 64 (45%) NAICS Categories solicited responded

3 Digit NAICS Code	# Contacts 5 yrs w/email	Responses	Response Rate	3 Digit NAICS Code	# Contacts 5 yrs w/email	Responses	Response Rate
211	30	2	6.67%	451	4		
212	13			452	6		
213	20			453	7		
221	49	5	10.20%	454	6		
236	13			481	7		
237	9	2	22.22%	484	10		
311	25	3	12.00%	486	9		
312	10	1	10.00%	488	4		
315	10			511	59	3	5.08%
316	7			512	5		
321	4			515	12	1	8.33%
322	12	2	16.67%	517	25		
323	6			518	21		
324	6			522	221	14	6.33%
325	158	6	3.80%	523	33		
326	11	1	9.09%	524	45	1	2.22%
327	4			525	56	2	3.57%
331	10			531	9		
332	23	1	4.35%	532	7		
333	54	4	7.41%	533	9	1	11.11%
334	245	8	3.27%	541	104	4	3.85%
335	24	1	4.17%	551	12		
336	34	2	5.88%	561	35	1	2.86%
337	9			562	7	1	14.29%
339	58	1	1.72%	611	10		
423	33	1	3.03%	621	21		
424	16			622	4		
441	7	1	14.29%	623	3		
443	3	1	33.33%	713	13	1	7.69%
445	4			721	5		
446	5			722	20	1	5.00%
448	16			812	11	2	18.18%

Performance Stock Price % Change	Count	Mean	Median	Std Dev	Max	Min
*Respondent Naics Categories	1288	9.88	-13.22	105.54	1007.75	-99.62
Respondent Companies	72	17.63	-3.27	130.42	978.17	-93.23

* History not available for two companies (1 NA for data range & 1 Ch 11)

Longevity (years)	Count	Mean	Median	Std Dev	Max	Min
All solicited	1731	14.48	13.5	6.06	46.92	5
Respondent Naics Categories	1290	14.46	13.67	6.17	46.92	5
Respondent Companies	74	13.81	13.46	5.09	27	5.17

3) Split-Half Reliability Test – This test proposed in Chapter IV is not appropriate in this survey because the survey does not include multiple questions of the same type and quality for which to split and test for correlation. Each question is of different type and independent of the other questions, though questions 6 - 11 all relate to the construct "measurement." Therefore, each question will now be stated with steps taken to address any reliability issues.

Question 1: Please enter your company code.

Steps taken: Format is defined and is required to be submitted as 9999.999 for the survey to be accepted. Two cases are noted with incorrect company code submissions, one of which advised the error by email for correction (input Company Code 5150.099 instead of 5150.009) while the other used the sample number "9999.999" and could not be identified for inclusion in the analysis. Better reliability may have been achieved by requiring a second input of the Company Code.

Question 2: How frequently does your product change/improve? (check most appropriate)

Steps taken: Select from three alternatives or "Don't Know." There is minimal ambiguity in the operational definition of the question.

Question 3: How frequently do your technical processes change/improve? (check most appropriate)

Steps taken: Select from three alternatives or "Don't Know." There is minimal ambiguity in the operational definition of the question.

Question 4: How frequently does your company or department change its performance measurement system? (select one)

Steps taken: Select from three alternatives or "Don't Know." There may be some ambiguity in the operational definition of "performance measurement system."

Question 5: What is your position in the company? (select one)

Steps taken: Select from a set of options or "Other." There is minimal ambiguity in the operational definition of the question.

Question 6: In which department do you work? (select one)

Steps taken: Select from set of options or "Other." There is minimal ambiguity in the operational definition of the question.

Question 7: Estimate the Number of Financial Measures you use to monitor performance or which are used to measure your performance (see following sample list to help estimate number of measures used).

Steps taken: The question uses Balanced Scorecard based terminology which is familiar in industry and examples of financial measures are provided for consideration.

Question 8: Estimate the Number of Internal Operating (Nonfinancial) Measures you use to monitor performance or which are used to measure your performance. (see following sample list to help estimate number of measures used).

Steps taken: The question uses Balanced Scorecard based terminology which is familiar in industry and examples of internal operating measures are provided for consideration.

Question 9: Estimate the Number of Employee Related (Learning and Growth; Nonfinancial) Measures you use to monitor performance; or which are used to measure your performance. (see following sample list to help estimate number of measures used).

Steps taken: The question uses Balanced Scorecard based terminology which is familiar in industry and examples of employee related measures are provided for consideration.

Question 10: Estimate the Number of Customer (Nonfinancial) Measures you use to monitor performance or which are used to measure your performance. (see following sample list to help estimate the number of measures used)

Steps taken: The question uses Balanced Scorecard based terminology which is familiar in industry and examples of customer related measures are provided for consideration.

Question 11: Rank in order from most important to least important the process types related to performance measures you use or by which your performance is measured

Process 1: Identity Processes (processes that define your company)

Process 2: Priority Processes (processes that are critical to support the identity of your company)

Process 3: Background Processes (processes that are necessary support to daily operations)

Process 4: Mandated Processes (processes necessary for regulatory compliance)

Steps taken: Process types are presented in a random ordered sequence with no possibility to select any item twice. Random sequencing of presentation and validity of response sequence is tested using 12 test company entries. Results of the test are shown in Table 54 documenting: 1) Sequence presented by instrument; 2) Ranked sequence input into survey test; and 3) Ranked sequence survey results as follows:

TABLE 54

VERIFICATION OF RANDOM ALTERNATIVE RESPONSE SEQUENCING

Co. No	Sequence Presented by Instrument			
	1	2	3	4
1000-001	I	M	B	P
1000-002	B	M	I	P
1000-003	B	I	M	P
1000-004	M	I	P	B
1000-005	B	I	M	P
1000-006	M	I	B	P
1000-007	P	I	M	B
1000-008	I	M	P	B
1000-009	P	I	B	M
1000-010	M	B	I	P
1000-011	I	B	M	P
1000-012	M	I	B	P
Confirmed alternatives presented in random sequence				

Co. No.	Ranked Sequence Input into Survey Test			
	1	2	3	4
1000-001	I	P	B	M
1000-002	M	I	P	B
1000-003	B	M	I	P
1000-004	P	B	M	I
1000-005	I	P	B	M
1000-006	M	I	P	B
1000-007	B	M	I	P
1000-008	P	B	M	I
1000-009	I	P	B	M
1000-010	M	I	P	B
1000-011	B	M	I	P
1000-012	P	B	M	I

Co. No.	Ranked Sequence Survey Results			
	1	2	3	4
1000-001	I	P	B	M
1000-002	M	I	P	B
1000-003	B	M	I	P
1000-004	P	B	M	I
1000-005	I	P	B	M
1000-006	M	I	P	B
1000-007	B	M	I	P
1000-008	P	B	M	I
1000-009	I	P	B	M
1000-010	M	I	P	B
1000-011	B	M	I	P
1000-012	P	B	M	I
Confirmed results consistent with respondent ranking				

Unlike the other questions, the operational definition of Question 11 contains ambiguity and is subject to interpretation. The ambiguity in the question, or way to respond, is confirmed by the comments from two respondents as follows: Respondent 56 “Didn't really understand Question 11 definitions;” and Respondent 73 “Seems difficult to rank the processes individually as hopefully the company's identity is based on the premise of providing quality service daily; which is designed to meet regulatory requirements. Therefore; they all work together and by focusing on one of the processes; we are also addressing the other processes at the same time.”

Question 11 is placed last in the survey because of anticipated difficulty. The survey format did not allow full definition or explanation of the processes under consideration, and the difficulty and potential difference of interpretation are noted by Keen (1997) as follows:

> Analyzing the salience of a firm’s processes is an important task that requires considerable thought and insight…. As we have seen, one of several complexities to be considered is that different groups and individuals see the salience of the same process differently. So the question “Whose valuation counts most? must be answered before a process’s importance to the entire firm can be determined (p. 54).

Strengths

Shepherd and Günter (2006) state that there is a need for performance measurement comparisons across market sectors since most studies are conducted within a specific market sector. This study is representative of a broad range of industries, with respondents representing 29 different 3-digit NAICS categories as noted in Table 55:

TABLE 55

RESPONDING COMPANY NAICS CATEGORY DESCRIPTIONS

3 Digit NAICS Code	Responding Company NAICS Category Descriptions
211	Oil and Gas Extraction
221	Utilities
237	Heavy and Civil Engineering Construction
311	Food Manufacturing
312	Beverage & Tobacco Product Manufacturing
322	Paper Manufacturing
325	Chemical Manufacturing
326	Plastics and Rubber Products
332	Fabricated Metal Product
333	Machinery Manufacturing
334	Computer and Electronic Product
335	Electrical Equipment, Appliance, and Component
336	Transportation Equipment Manufacturing
339	Miscellaneous Manufacturing
423	Merchant Wholesalers, Durable Goods
441	Motor Vehicle and Parts Dealers
443	Electronics and Appliance Stores
511	Publishing Industries (except Internet)
515	Broadcasting (except Internet)
522	Credit Intermediation and Related Activities
524	Insurance Carriers and Related Activities
525	Funds, Trusts, and Other Financial Vehicles
533	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)
541	Professional, Scientific, and Technical Services
561	Administrative and Support Services
562	Waste Management &Remediation Services
713	Amusement, Gambling, & Recreation Industries
722	Food Services and Drinking Places
812	Personal and Laundry Services

Hypotheses 2, 3, and 4 results are based on respondents indicating the number of measures they use in each of 4 (Balanced Scorecard) categories with sample metrics provided for consideration as follows:

1) Financial Measures: Sales; Capital Expenditures; Maintenance Expenditures; Operating Expenses; SG&A Expenses; Product Quality Costs (warranty costs); ROI; ROA; Total Manufacturing Costs; Labor Costs; Material Costs; Indirect (overhead) Costs; Manufacturing Process Improvement Costs…

2) Internal Operating (Non-Financial) Measures: Information Technology (% cost); New Product % of Sales; Proprietary Products % of Sales; New Product Introduction vs Competitors; Manufacturing Process Capabilities; Time to Develop Next Generation of Products; Product quality (defect rates); Delivery (on time); Manufacturing Efficiency; Suppliers (quality, defect rates, dependability, on time delivery); Suppliers (number of); R&D (new product introduction cycle time); Production Volume; Labor Productivity (hours used, available, overtime); Machine Productivity (hours running, available, downtime); Material Usage (inefficiency, waste); Setup Efficiency (setup time, number of setups); Manufacturing Cycle Time (total process time); Inventory (turnover); Product Defects (number of errors, rework, scrap)…

3) Learning and Growth (Employee related Non-Financial) Measures: Safety (number of accidents, injuries); Employee Satisfaction (surveys, grievances); Employee Skills (level of education, experience); Employee Empowerment (# suggestions, # of improvement teams); Employee Training / Education (hours or time allocated for training); Employee Loyalty / Turnover; Absenteeism; Employee Perception of Leadership…

4) Customer (Non-Financial) Measures: Customer Acquisition (# new, % sales from new); Customer Retention / Loyalty (# repeat customers); Customer Satisfaction (surveys, complaints); Phone System Utility (automated, response time); Market Share; Time to Fill Customer Orders; Deliver Performance (on-time, % correct delivery); Time to Respond to Customer Problems; Flexibility / Responsiveness (ability to vary product)…

Deriving the number of financial vs. nonfinancial measures used, and the number of categories of balanced scorecard metrics used from these defined measures increases reliability by providing clarity of the operational definition for each of the questions, thereby minimizing the potential of questionable understanding or submission of a casual estimate of an aggregate / general response.

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In summary, strengths of this study include:

- A wide range of industries represented in responses to the survey
- Performance (dependent variable) based on stock price change over a five-year period
    - Adjusted for dividends and splits
    - Based on one-year rolling average to eliminate year-end and seasonal distortions
    - Standardized based on 3-digit NAICS Code to eliminate industry variance
- Respondent demographics are comparable to the sample population
- Clarity in the operational definition of questions regarding financial, nonfinancial and balanced scorecard measurement systems

Suggestions for Further Research

In conclusion, responses from companies in broad range of industries are received and compared for performance based on change in stock price over a five-year time frame using a one-year rolling average to eliminate seasonal or year-end distortions adjusted for dividends and splits. Results of the research support the hypothesis that nonfinancial measures correlate more positively to firm value than financial measures, and that the number of categories of balanced scorecard metrics used correlate to firm value. These results, however, do not address specific measurements, statistical validity of the measurements, or linkages between selected measurements and strategy. There also is no assurance that the "number of measures" in any category defined by respondents in this study reflects the weight placed on the value of those measures for decision making. Further study regarding specific measurements utilized, weighting of the measurements applied by decision makers, statistical validity of the measurements, and linkages between measurements and strategy may provide further insights into characteristics of effective performance measurement systems.

Statistical significance is not achieved in H_1 and this is the area which offers the greatest potential for exploration. The following changes to methodology are recommended: 1) Utilize a targeted solicitation campaign with specifically defined company contact emails (rather than the general company emails utilized in this research) to increase the response rate; 2) Provide well articulated definition and explanation of the processes under consideration to reduce ambiguity; and 3) Request ranking of the processes using multiple questions stated in different ways to increase measurable reliability using the split half reliability test.

Finally, as noted by Shepherd and Günter (2006) "…it is important to treat measurement systems as dynamic entities that must respond to environmental and strategic change. Consequently, further work is needed to investigate the factors influencing the evolution of performance measurement systems … and how to handle their ongoing maintenance" (p. 253).

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APPENDICES

Appendix A: The Firm—A Systems Perspective (Figure 1) Detailed Description with Citations

Starting at the bottom of Figure 1, the firm is a subsystem of a larger value chain system. The value chain, comprised of upstream (Pre-Firm Value Chain) and downstream (Post-Firm Value Chain) subsystems, provides value to the metasystem environment. The firm attempts to optimize its performance based on relationships and information flow with other firms (subsystems) in the value chain (Lee, Y.T., 2001; Leenders, Johnson, Flynn & Fearon, 2006; Locke, 1996) using a number of financial and nonfinancial performance measures (Frazelle, 2002; Shank & Govindarajan, 1993).

Assets are managed by the firm using a variety of processes to generate cash flow. For the purpose of this research, business processes considered are Identity, Priority, Background and Mandated processes which are "…coordinated activities that involve people, procedures, and technology" (Keen, 1997, p. 13). These processes are used throughout the firm system. All processes require the use of resources (cash flow), but not all processes make a positive contribution to cash flow. The firms' cash flow from Operating activities is impacted by the use of associated controls and measures (Amir & Lev, 1996; Baker, Gibbons & Murphy, 1994; Banker, Potter,& Srinivasan, 2000; Bourne, Kennerley, & Franko-Santos, 2005; Boyd, 2006; Schmenner, 1990; Zheng, H., Zhang, G., & Park, S. H.,1995). Many of these controls are designed to improve product/service quality, but it should be noted that profit is not necessarily a function of quality (Dickinson, 2007; Sterman, Repenning, & Kofman, 1997). In addition to operating controls, the operating cycle impacts cash flow from operations (Stickney, Brown & Wahlen, 2004, p. 116). Firm management typically perceives the value of operations by means of managerial reports based on accounting measures (Davidson & Weil, 1978; Johnson, 1981; Palia, 2007; Roztocki, 2000a; Roztocki 2000b; Roztocki, 2000c, Roztocki, N., & Needy, 2000; Roztocki & Weistroffer, 2005; Roztocki & Weistroffer, 2006) which have a long history of use (Fleischman, & Tyson, 1997; Heier, 2000). This managerial reporting directly impacts management perception of firm value and contributes to financing and investing decisions made by management. Firm valuation typically comes from cash flows (Copeland, Weston and Shastri, 2005; Damodaran, 2002; Ruback, 2002) and managerial reporting contributes to an asymmetry of information between management perception and the market perception of firm value (Chirinko & Singha, 2000; Fama & French, 2002) since market perception is constrained by information contained in financial reports and the firms risk to anticipate stock returns (Fama & French, 1992). A variety of factors influence management corporate financing decisions (Taggert, 1977) and decisions about the optimal capital structure. Major factors are: cost of debt and equity (Kemsley & Nissim, 2002; Modigliani & Miller, 1958), bankruptcy costs (Altman, 1984), lease versus debt (Ang & Peterson, 1984), retention of dividends (Allen, Bernardo, & Welch, 2000; Bell & Jenkinson, 2002; Fama & French, 2002; Grullon & Michaely, 2002), reduction of risk through diversification (Billet & Mauer, 2000), market characteristics (Baker & Wurgler, 2002), and use of options (Black & Scholes, 1972; Fischer, 1978). Firm management can further use finance policy as a form of signaling (DeAngelo, DeAngelo & Skinner, 2000) to impact market perception of firm value, and thereby impact stock price.

Appendix B: Proposed Dissertation Timeline

Appendix C: Hypotheses

H_1: Salience of business processes identified for measurement correlate to firm value as tested by Kruskal-Wallis one-way ANOVA.

H_{1a}: Identity business processes using the means results from H_1 have a higher positive correlation to firm value than Priority business processes as tested by the Chi-Square Contingency Test of Association.

H_{1b}: Priority business processes using the means results from H_1 have a higher positive correlation to firm value than Background business processes as tested by the Chi-Square Contingency Test of Association.

H_2: Nonfinancial performance measures are more correlated to firm value than financial measures as tested by Kruskal-Wallis one-way ANOVA.

H_3: The relative importance of nonfinancial performance measures compared to financial measures using the results from H_2 is greater in high clock-speed industries than in low clock-speed industries as tested by Cramer's Phi.

H_4: The number of categories of Balanced Scorecard metrics used correlate to firm value as tested by Kruskal-Wallis one-way ANOVA.

Appendix D:

Consent Form
Web-Based Survey

Performance Measures for Managerial Decision Making: Performance Measurement Synergies in Multi-Attribute Performance Measurement Systems

You are invited to participate in a research study conducted by Robert Fowke from Portland State University, Systems Science: Business Administration. The researcher hopes to learn the impact of use of different performance measures, varied feedback lags, and distribution of performance measurement information on business performance, in partial fulfillment of the requirements for a doctoral degree, under the supervision of Dr. Beverly Fuller. You were selected as a possible participant in this study based on your employment in a company included in North American Industrial Classification System (NAICS) categories under review.

If you decide to participate, you will be asked to complete the following questionnaire regarding performance measurement criteria and processes in your company/department. Any information that is obtained in connection with this study and that can be linked to you or identify you will be kept confidential. This information will be kept confidential by coding of companies and participants (Company XXXX, Participant 1 – x). Each participant has the option to receive results of the study upon request.

Your participation is voluntary. You do not have to take part in this study, and it will not affect your relationship with your company or Portland State University. You may also withdraw from this study at any time without affecting your relationship with your company or Portland State University.

If you have concerns or problems about your participation in this study or your rights as a research subject, please contact the Human Subjects Research Review Committee, Office of Research and sponsored Projects, 111 Cramer Hall, Portland State University, (503) 725-4288 / 1-877-480-4400. If you have questions about the study itself, contact Robert Fowke at Portland State University, c/o Dr. Beverly Fuller, SBA.

By checking this box to continue indicates that you have read and understand the above information and agree to take part in this study. Please understand that you may withdraw your consent at any time without penalty, and that, by not continuing, you are not waiving any legal claims, rights or remedies. The researcher will provide you with a copy of this form for your own records upon request.

Results of the study will be available to participants upon request.

Appendix E: Questionnaire

1) How frequently does your product change/improve?
(check most appropriate)

	Check One
<3 yrs	
4-10 yrs	
>10 yrs	
Don’t know	

2) How frequently do your technical processes change/improve?
(check most appropriate)

	Check One
<3 yrs	
4-10 yrs	
>10 yrs	
Don’t know	

3) How frequently does your company or department change its performance measurement system?

	Check One
< 3 yrs	
3 - 10 years	
> 10 yrs	
Don’t know	

4) What is your position in the company?

Check One

Executive ☐

VP ☐

Front line Supervisor ☐

Other ☐

5) In which department do you work?

Check One

Corporate ☐

HR ☐

Finance ☐

Marketing ☐

Production ☐

Engineering ☐

Other ☐

Estimate Number

6) Estimated Number of Financial Measures you use to monitor performance, or which are used to measure your performance (see following sample list) ☐

Financial	
Sales	Return on Investment
Capital Expenditures	Total Manufacturing Cost
Maintenance Expenditures	Labor cost
Operating Expense	Material cost
SG & A Expense	Indirect (overhead) cost

Product Quality Costs (Warranty cost)	Manufacturing Process Improvement Costs

Estimate Number

7) Estimated Number of Internal Operating (Nonfinancial) Measures you use to monitor performance, or which are used to measure your performance (see following sample list)

Internal Operating (Nonfinancial)	
Information Technology (% cost)	Suppliers (Dependability, on time Delivery)
New Product % of Sales	Suppliers (number)
Proprietary Products % of Sales	R&D (New Product Introduction Cycle Time)
New Product Introduction vs Competitors	Production Volume
New Product Introduction vs Plan	Labor Productivity (hours used, available, overtime)
Manufacturing Process Capabilities	Machine Productivity (hours running, available, downtime)
Time to Develop Next Generation of Products	Material usage (inefficiency, waste)
Product Quality (defect rates)	Setup Efficiency (setup time, number of setups)
Delivery (on time)	Manufacturing Cycle Time (total process time)
Manufacturing Efficiency	Inventory (turnover)
Suppliers (quality, defect rates)	Product Defects (number of errors, rework, scrap)

Estimate Number

8) Estimated Number of Employee (Learning and Growth, Nonfinancial) Measures you use to monitor performance, or which are used to measure your performance (see following sample list)

Employee (Learning and Growth, Nonfinancial)	
Safety (number of accidents, injuries)	Employee Training/Education (hours or time allocated for training)
Employee satisfaction (surveys, grievances)	Employee Loyalty / Turnover
Employee Skills (level of education, experience)	Absenteeism

Employee Empowerment (# suggestions, # on improvement teams)	Employee Perception of Leadership

Estimate Number

9) Estimated Number of Customer (Nonfinancial) Measures you use to monitor performance, or which are used to measure your performance (see following sample list)

Customer (Nonfinancial)	
Customer Acquisition (# new, % Sales From New)	Time to Fill Customer Orders
Customer Retention / Loyalty (# Repeat Customers)	Deliver Performance (on-time, % Correct Delivery)
Customer Satisfaction (surveys, complaints)	Time to Respond to Customer Problems
Phone System Utility (Automated, Response Time)	Flexibility/Responsiveness (ability to vary product)
Market Share	

10) Are the performance measures you use primarily related to:
(rank 1 – 4, 1 most related and 4 least related)

Rank 1 - 4

Identity processes (processes that define your company)

Priority processes (processes that are critical to support the identity of your company)

Background processes (processes that are necessary support to daily operations)

Mandated processes (processes necessary for regulatory compliance)

Appendix F: NAICS Company Listings

http://www.mergentonline.com.proxy.lib.pdx.edu/compsearchresults.asp?searchtype=compname&searchtext=&codetype=naic&industrycode=31621&Index=null&country=null&usonly=on&bstype=codeandcountry					
Prim NAICS 31621					
Footwear Manufacturing					
US Exchanges Only			Accessed:		9/12/2007
Company Name	SIC	Exchange	Ticker	Active/In	Country
Barry (R.G.) Corp.	3149	ASE	DFZ	Active	United States
Brown Shoe Co., Inc.	3144	NYS	BWS	Active	United States
Cole (Kenneth) Productions, Inc.	3143	NYS	KCP	Active	United States
Crocs Inc	3021	NMS	CROX	Active	United States
Deckers Outdoor Corp.	3021	NMS	DECK	Active	United States
Foot Locker, Inc.	5661	NYS	FL	Active	United States
Iconix Brand Group Inc	3149	NMS	ICON	Active	United States
K-Swiss, Inc	3149	NMS	KSWS	Active	United States
LaCrosse Footwear, Inc.	3021	NMS	BOOT	Active	United States
Madden (Steven) Ltd.	3144	NMS	SHOO	Active	United States
NIKE, Inc	3021	NYS	NKE	Active	United States
Phoenix Footwear Group, Inc.	3144	ASE	PXG	Active	United States
Rocky Brands Inc	3143	NMS	RCKY	Active	United States
Skechers U S A, Inc.	3143	NYS	SKX	Active	United States
Skins Inc	3149	OTC	SKNN	Active	United States
Timberland Co. (The)	3143	NYS	TBL	Active	United States
Weyco Group, Inc	5139	NMS	WEYS	Active	United States
Wolverine World Wide, Inc. (US)	3149	NYS	WWW	Active	United States

http://www.mergentonline.com.proxy.lib.pdx.edu/compsearchresults.asp?searchtype=compname&searchtext=&codetype=naic&industrycode=331210&Index=null&country=null&usonly=on&bstype=codeandcountry

Prime NAICS 331210
Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
US Exchanges Only Accessed: 9/12/2007

Company Name	SIC	Exchange	Ticker	Active/In	Country
Allegheny Technologies, Inc (US)	3317	NYS	ATI	Active	United States
Corinth Pipeworks SA (Greece)	3317	OTC	CPWK F	Active	Greece
Dayton Superior Corporation	3317	NMS	DSUP	Active	United States
Friedman Industries, Inc. (US)	3317	ASE	FRD	Active	United States
Northwest Pipe Co.	3317	NMS	NWPX	Active	United States
Novamerican Steel Inc.	3317	NMS	TONS	Active	Canada
Sumitomo Pipe & Tube (Jpn)	3317	OTC	SIBT F	Active	Japan
Synalloy Corp.	3317	NMS	SYNL	Active	United States
Tarpon Industries Inc	3317	ASE	TPO	Active	United States
Tenaris SA	3317	NYS	TS	Active	Luxembourg

http://www.mergentonline.com.ezproxy.lib.pdx.edu/compsearchresults.asp?searchtype=compname&searchtext=&codetype=naic&industrycode=33151&Index=null&country=null&usonly=on&bstype=codeandcountry

Prim NAICS 33151
Ferrous Metal Foundries
US Exchanges Only Accessed: 9/17/2007

Company Name	SIC	Exchange	Ticker	Active/Inactive	Country
Aceralia Corporacion Siderurgica(Spain)	3325	OTC	ARAL Y	Inactive	Spain
Amanasu Environment Corp	3325	OTC	AMSU	Active	United States
Ampco-Pittsburgh Corp.	3325	NYS	AP	Active	United States
Arcelor Mittal	3325	NYS	MT	Active	Netherlands
Atchison Casting Corp. (US)	3325	OTC	AHNC Q	Active	United States
Buderus AG Lahn Wetzlar	3312	OTC	BRSJ F	Active	Germany
Grupo Simec S.A.B. de C.V.	3325	ASE	SIM	Active	Mexico
Kawagishi Bridge Works Co., Ltd.(Jpn)	3325	OTC	KGBG F	Active	Japan
Mechel OAO	3325	NYS	MTL	Active	Russia
Olympic Steel Inc.	5051	NMS	ZEUS	Active	United States
Precision Castparts Corp.	3324	NYS	PCP	Active	United States
Steel Dynamics Inc.	3312	NMS	STLD	Active	United States
Thyssen Industrie AG (Germany, F.R.)	3325	OTC	THYI F	Active	Germany
United States Steel Corp. (New)	3312	NYS	X	Active	United States
Universal Stainless & Alloy Products	3312	NMS	USAP	Active	United States

http://www.mergentonline.com.proxy.lib.pdx.edu/compsearchresults.asp?searchtype=compname&searchtext=&codetype=naic&industrycode=334111&Index=null&country=null&usonly=on&bstype=codeandcountry

Prim NAICS 334111
Electronic Computer Manufacturing
US Exchanges Only — Accessed: 9/12/2007

Company Name	SIC	Exchange	Ticker	Active/In	Country
Apple Inc	3571	NMS	AAPL	Active	United States
Catcher Holdings, Inc.	3571	OTC	CTHH	Active	United States
Cintel Corp	3571	OTC	CNCN	Active	United States
Concurrent Computer Corp. (US)	3571	NMS	CCUR	Active	United States
Cray Inc	3571	NMS	CRAY	Active	United States
Daewoo Telecom. (S.Korea)	3571	OTC	DWOO F	Active	Korea (South)
Dell Inc	3571	NMS	DELL	Active	United States
Gateway Inc	3571	NYS	GTW	Active	United States
Heiler Software AG (Germany)	3571	OTC	HEIR F	Active	Germany
Hewlett-Packard Co	3571	NYS	HPQ	Active	United States
InPlay Technologies Inc	3571	NAS	NPLA	Active	United States
International Business Machines	3571	NYS	IBM	Active	United States
Maxwell Technologies, Inc. (US)	3571	NMS	MXWL	Active	United States
Micro Book International, Inc. (FL)	3571	OTC	MBKI	Active	United States
National Datacomputer, Inc.	3571	OTC	IDCP	Active	United States
NDS Group Plc	3571	NMS	NNDS	Active	United Kingdom
NEC Corp	3571	NMS	NIPN Y	Active	Japan
Neoware Inc	3571	NMS	NWRE	Active	United States
Omnicell Inc	3571	NMS	OMCL	Active	United States
Rackable Systems Inc	3571	NMS	RACK	Active	United States
Sandston Corp	3571	OTC	SDON	Active	United States
Silicon Graphics Inc.	3571	NAS	SGIC	Active	United States
Socket Communications, Inc.	3571	NMS	SCKT	Active	United States
SteelCloud Inc	3571	NAS	SCLD	Active	United States
Sun Microsystems Inc	3571	NMS	JAVA	Active	United States
Super Micro Computer Inc	3571	NMS	SMCI	Active	United States
Web.com Inc	7389	NMS	WWWW	Active	United States
XATA Corp.	3571	NAS	XATA	Active	United States

http://www.mergentonline.com.ezproxy.lib.pdx.edu/compsearchresults.asp?searchtype=compname&searchtext=&codetype=naic&industrycode=334119&Index=null&country=null&usonly=on&bstype=codeandcountry

Prim NAICS 334119
Other Computer Peripheral Equipment Manufacturing
US Exchanges Only Accessed: 9/17/2007

Company Name	SIC	Exchange	Ticker	Active/Inactive	Country
3Com Corp.	3577	NMS	COMS	Active	United States
Adaptec Inc. (United States)	3577	NMS	ADPT	Active	United States
Alliance Distributors Holding	3577	OTC	ADTR	Active	United States
Amedia Networks Inc	3577	OTC	AANI	Active	United States
Apem SA (France)	3577	OTC	AEMS F	Active	France
Astrocom Corp.	3577	OTC	ATCC Q	Active	United States
Astro-Med, Inc.	3577	NMS	ALOT	Active	United States
Avici Systems Inc (US)	3577	NMS	AVCI	Active	United States
Avocent Corp (United States)	3577	NMS	AVCT	Active	United States
Bio-Key International Inc	3577	OTC	BKYI	Active	United States
Black Box Corp. (DE) (US)	3577	NMS	BBOX	Active	United States
Communication Intelligence (DE)	3577	OTC	CICI	Active	United States
Copytele Inc	3577	OTC	COPY	Active	United States
CSP Inc	3577	NMS	CSPI	Active	United States
DataMetrics Corp.	3577	OTC	DMCP	Active	United States
Digi International, Inc. (US)	3577	NMS	DGII	Active	United States
Digital River, Inc.	5045	NMS	DRIV	Active	United States
Emulex Corporation (US)	3577	NYS	ELX	Active	United States
Extreme Networks, Inc.	3577	NMS	EXTR	Active	United States
Ezenia! Inc. (United States)	3577	OTC	EZEN	Active	United States
F5 Networks, Inc.	3577	NMS	FFIV	Active	United States
FiberTower Corp	4812	NMS	FTWR	Active	United States
Foundry Networks Inc	3577	NMS	FDRY	Active	United States
Franklin Wireless Corp	7373	OTC	FKLT	Active	United States
Hauppauge Digital, Inc.	3577	NMS	HAUP	Active	United States
Hypercom Corp	3578	NYS	HYC	Active	United States
icad inc (United States)	3577	NAS	ICAD	Active	United States
Immersion Corp (United States)	3577	NMS	IMMR	Active	United States
InFocus Corp	3577	NMS	INFS	Active	United States
Intelligent Systems Corp.	8742	ASE	INS	Active	United States
International Lottery & Totalizator Sys	3578	OTC	ITSI	Active	United States
Interphase Corp. (United States)	3577	NMS	INPH	Active	United States
Intrusion Inc	3577	OTC	INTZ	Active	United States
Ion Networks, Inc.	3577	OTC	IONN	Active	United States
Juniper Networks Inc	3577	NMS	JNPR	Active	United States
Key Tronic Corp.	3577	NMS	KTCC	Active	United States

Konami Corp	3577	NYS	KNM	Active	Japan
Lafe Technology Ltd. (Singapore)	3679	OTC	LAFE F	Active	Bermuda
Lantronix Inc. (United States)	3577	NAS	LTRX	Active	United States
Lexmark International, Inc.	3577	NYS	LXK	Active	United States
Logitech International SA	3577	NMS	LOGI	Active	Switzerland
Media Sciences International Inc.	3577	NAS	MSII	Active	United States
Microfield Group Inc	1731	OTC	MICG	Active	United States
Mitek Systems, Inc.	3577	OTC	MITK	Active	United States
Mobility Electronics Inc (US)	3577	NMS	MOBE	Active	United States
Moneyflow Systems International Inc	3578	OTC	MFLW	Active	United States
NCR Corp. (New)	3578	NYS	NCR	Active	United States
Neonode Inc	3577	NAS	NEON	Active	United States
Network Connection, Inc. (The) (US)	3577	BSE	NWC	Active	United States
Orbotech Ltd. (Israel)	3577	NMS	ORBK	Active	Israel
Peerless Systems Corp.	7372	NAS	PRLS	Active	United States
Printronix, Inc.	3577	NMS	PTNX	Active	United States
Rada Electronic Industries Ltd.	3577	NAS	RADA	Active	Israel
RadiSys Corp.	3577	NMS	RSYS	Active	United States
Ridgefield Acquisition Corp	3577	OTC	RDGA	Active	United States
Rimage Corp.	3577	NMS	RIMG	Active	United States
Riverbed Technology Inc	3577	NMS	RVBD	Active	United States
S&T Sys. Int. & Tech. Dist.(Austria)	3577	OTC	STSQ Y	Active	Austria
SCM Microsystems, Inc.	3577	NMS	SCMM	Active	United States
Secure Computing Corp. (US)	3577	NMS	SCUR	Active	United States
Sedona Corp	5045	OTC	SDNA	Active	United States
Sigma Designs, Inc. (United States)	3577	NMS	SIGM	Active	United States
Small Cap Strategies Inc	3577	OTC	SMCA	Active	United States
SMART Modular Technologies, Inc	3577	NMS	SMOD	Active	Cayman Islands
Stratasys, Inc.	3577	NMS	SSYS	Active	United States
TAT Technologies Ltd. (Israel)	3577	NAS	TATT F	Active	Israel
TransAct Technologies Inc.	3577	NMS	TACT	Active	United States
Viseon Inc	3577	OTC	VSNI	Active	United States
Zamba Corp. (United States)	5045	OTC	ZMBA	Active	United States

Appendix G: NAICS Company Comparisons

Prim NAICS 31621
Footwear Manufacturing
US Exchanges Only
12 month rolling average year to year adjusted stock price comparison
(% change = (A/B-1)%)

	A	9/07 -	9/07 -	9/07 -	9/07 -
	B	9/06	9/05	9/04	9/02
	Company	1 yr	2 yr	3 yr	5 yr
1	Barry (R.G.) Corp.	41%	105%	197%	71%
2	Brown Shoe Co., Inc.	32%	92%	82%	249%
3	Cole (Kenneth) Productions, Inc.	-4%	-14%	-19%	24%
4	Crocs Inc				
5	Deckers Outdoor Corp.	118%	136%	208%	1563%
6	Foot Locker, Inc.	-8%	-15%	-5%	59%
7	Iconix Brand Group Inc	50%	22%	701%	652%
8	K-Swiss, Inc	-3%	-5%	32%	195%
9	LaCrosse Footwear, Inc.	33%	45%	113%	425%
10	Madden (Steven) Ltd.	16%	158%	152%	213%
11	NIKE, Inc	30%	31%	53%	114%
12	Phoenix Footwear Group, Inc.	-26%	-38%	-57%	
13	Rocky Brands Inc	-35%	-52%	-36%	124%
14	Skechers U S A, Inc.	38%	107%	160%	79%
15	Skins Inc				
16	Timberland Co. (The)	-14%	-22%	-8%	43%
17	Weyco Group, Inc	25%	30%	63%	168%
18	Wolverine World Wide, Inc. (US)	20%	34%	86%	180%
	Count	**16**	**16**	**16**	**15**
	Median	**22%**	**30%**	**73%**	**168%**
	Mean	**20%**	**39%**	**108%**	**277%**
	Standard Deviation	**36%**	**64%**	**178%**	**391%**
	Standard Deviation from Mean				
	Barry (R.G.) Corp.	0.60	1.04	0.50	-0.53
	Brown Shoe Co., Inc.	0.33	0.84	-0.14	-0.07
	Cole (Kenneth) Productions, Inc.	-0.63	-0.81	-0.71	-0.65
	Crocs Inc				
	Deckers Outdoor Corp.	2.71	1.53	0.56	3.28
	Foot Locker, Inc.	-0.76	-0.83	-0.63	-0.56
	Iconix Brand Group Inc	0.83	-0.26	3.33	0.96
	K-Swiss, Inc	-0.61	-0.68	-0.42	-0.21
	LaCrosse Footwear, Inc.	0.37	0.10	0.03	0.38
	Madden (Steven) Ltd.	-0.09	1.87	0.25	-0.17
	NIKE, Inc	0.28	-0.12	-0.30	-0.42
	Phoenix Footwear Group, Inc.	-1.25	-1.19	-0.93	

Rocky Brands Inc	-1.50	-1.41	-0.80	-0.39
Skechers U S A, Inc.	0.50	1.07	0.29	-0.51
Skins Inc				
Timberland Co. (The)	-0.92	-0.95	-0.65	-0.60
Weyco Group, Inc	0.14	-0.13	-0.25	-0.28
Wolverine World Wide, Inc. (US)	0.02	-0.07	-0.12	-0.25

Prime NAICS 331210
Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
US Exchanges Only
12 month rolling average year to year adjusted stock price comparison
(% change = (A/B-1)%)

	A	9/07 -	9/07 -	9/07 -	9/07 -
	B	9/06	9/05	9/04	9/02
	Company	1 yr	2 yr	3 yr	5 yr
1	Allegheny Technologies, Inc (US)	86%	324%	667%	691%
2	Corinth Pipeworks SA (Greece)				
3	Dayton Superior Corporation				
4	Friedman Industries, Inc. (US)	25%	30%	163%	336%
5	Northwest Pipe Co.	29%	50%	131%	105%
6	Novamerican Steel Inc.	12%	1%	145%	606%
7	Sumitomo Pipe & Tube (Jpn)				
8	Synalloy Corp.	93%	132%	199%	573%
9	Tarpon Industries Inc	-71%			
10	Tenaris SA	42%	236%	650%	
	Count	**7**	**6**	**6**	**5**
	Median	**29%**	**91%**	**181%**	**573%**
	Mean	**31%**	**129%**	**326%**	**462%**
	Standard Deviation	**54%**	**128%**	**259%**	**239%**
	Standard Deviation from Mean				
	Allegheny Technologies, Inc (US)	1.02	1.53	1.32	0.96
	Corinth Pipeworks SA (Greece)				
	Dayton Superior Corporation				
	Friedman Industries, Inc. (US)	-0.11	-0.77	-0.63	-0.53
	Northwest Pipe Co.	-0.03	-0.61	-0.75	-1.49
	Novamerican Steel Inc.	-0.34	-1.00	-0.70	0.60
	Sumitomo Pipe & Tube (Jpn)				
	Synalloy Corp.	1.14	0.03	-0.49	0.46
	Tarpon Industries Inc	-1.87			
	Tenaris SA	0.20	0.83	1.25	

	Prim NAICS 33151 Ferrous Metal Foundries US Exchanges Only 12 month rolling average year to year adjusted stock price comparison (% change = (A/B-1)%)				
	A	9/07 -	9/07 -	9/07 -	9/07 -
	B	9/06	9/05	9/04	9/02
	Company	1 yr	2 yr	3 yr	5 yr
1	Aceralia Corporacion Siderurgica(Spain)				
2	Amanasu Environment Corp				
3	Ampco-Pittsburgh Corp.	51%	176%	195%	271%
4	Arcelor Mittal	70%	76%	327%	2669%
5	Atchison Casting Corp. (US)				
6	Buderus AG Lahn Wetzlar				
7	Grupo Simec S.A.B. de C.V.	84%	160%	404%	989%
8	Kawagishi Bridge Works Co., Ltd.(Jpn)				
9	Mechel OAO	40%			
10	Olympic Steel Inc.	-2%	43%	107%	549%
11	Precision Castparts Corp.	86%	168%	332%	631%
12	Steel Dynamics Inc.	62%	142%	215%	484%
13	Thyssen Industrie AG (Germany, F.R.)				
14	United States Steel Corp. (New)	60%	103%	182%	459%
15	Universal Stainless & Alloy Products	70%	157%	256%	289%
	Count	**9**	**8**	**8**	**8**
	Median	**62%**	**149%**	**236%**	**516%**
	Mean	**58%**	**128%**	**252%**	**793%**
	Standard Deviation	**27%**	**48%**	**97%**	**791%**
	Standard Deviation from Mean				
	Aceralia Corporacion Siderurgica(Spain)				
	Amanasu Environment Corp				
	Ampco-Pittsburgh Corp.	-0.24	0.98	-0.59	-0.66
	Arcelor Mittal	0.46	-1.08	0.77	2.37
	Atchison Casting Corp. (US)				
	Buderus AG Lahn Wetzlar				
	Grupo Simec S.A.B. de C.V.	0.96	0.66	1.57	0.25
	Kawagishi Bridge Works Co., Ltd.(Jpn)				
	Mechel OAO	-0.66			
	Olympic Steel Inc.	-2.25	-1.75	-1.50	-0.31
	Precision Castparts Corp.	1.04	0.83	0.83	-0.20
	Steel Dynamics Inc.	0.16	0.29	-0.38	-0.39
	Thyssen Industrie AG (Germany,				

F.R.)				
United States Steel Corp. (New)	0.08	-0.51	-0.73	-0.42
Universal Stainless & Alloy Products	0.45	0.59	0.04	-0.64

	Prim NAICS 334111 Electronic Computer Manufacturing US Exchanges Only 12 month rolling average year to year adjusted stock price comparison (% change = (A/B-1)%)				
	A	9/07 -	9/07 -	9/07 -	9/07 -
	B	9/06	9/05	9/04	9/02
	Company	1 yr	2 yr	3 yr	5 yr
1	Apple Inc	58%	169%	669%	956%
2	Catcher Holdings, Inc.	-57%			
3	Cintel Corp	77%	646%	-26%	
4	Concurrent Computer Corp. (US)	-30%	-21%	-47%	-81%
5	Cray Inc	18%	1%	-65%	-16%
6	Daewoo Telecom. (S.Korea)				
7	Dell Inc	-4%	-33%	-25%	0%
8	Gateway Inc	-16%	-57%	-60%	-65%
9	Heiler Software AG (Germany)				
10	Hewlett-Packard Co	36%	96%	111%	165%
11	InPlay Technologies Inc	-31%	-10%	-26%	-75%
12	International Business Machines	27%	22%	17%	17%
13	Maxwell Technologies, Inc. (US)	-23%	22%	27%	57%
14	Micro Book International, Inc. (FL)				
15	National Datacomputer, Inc.	-53%	-69%	-76%	-56%
16	NDS Group Plc	6%	44%	99%	216%
17	NEC Corp	-16%	-9%	-30%	-31%
18	Neoware Inc	-35%	23%	23%	43%
19	Omnicell Inc	62%	151%	41%	207%
20	Rackable Systems Inc	-42%			
21	Sandston Corp	117%	15%	-79%	-90%
22	Silicon Graphics Inc.				
23	Socket Communications, Inc.	-21%	-32%	-68%	-32%
24	SteelCloud Inc	-18%	-53%	-65%	-47%
25	Sun Microsystems Inc	24%	32%	29%	-30%
26	Super Micro Computer Inc				
27	Web.com Inc	2%	97%	10%	-79%
28	XATA Corp.	-9%	-8%	-8%	4%
	Count	**23**	**21**	**21**	**20**
	Median	**-9%**	**15%**	**-25%**	**-23%**
	Mean	**3%**	**49%**	**21%**	**53%**
	Standard Deviation	**44%**	**151%**	**158%**	**232%**
Standard Deviation from Mean					
	Apple Inc	1.25	0.80	4.10	3.90
	Catcher Holdings, Inc.	-1.37			

Cintel Corp	1.68	3.96	-0.30	
Concurrent Computer Corp. (US)	-0.75	-0.46	-0.43	-0.58
Cray Inc	0.34	-0.32	-0.55	-0.30
Daewoo Telecom. (S.Korea)				
Dell Inc	-0.16	-0.54	-0.30	-0.23
Gateway Inc	-0.44	-0.70	-0.52	-0.51
Heiler Software AG (Germany)				
Hewlett-Packard Co	0.75	0.31	0.57	0.48
InPlay Technologies Inc	-0.78	-0.39	-0.30	-0.55
International Business Machines	0.55	-0.18	-0.03	-0.15
Maxwell Technologies, Inc. (US)	-0.61	-0.18	0.04	0.01
Micro Book International, Inc. (FL)				
National Datacomputer, Inc.	-1.29	-0.78	-0.62	-0.47
NDS Group Plc	0.06	-0.03	0.49	0.70
NEC Corp	-0.43	-0.39	-0.33	-0.36
Neoware Inc	-0.87	-0.17	0.01	-0.04
Omnicell Inc	1.34	0.68	0.12	0.67
Rackable Systems Inc	-1.02			
Sandston Corp	2.60	-0.23	-0.64	-0.62
Silicon Graphics Inc.				
Socket Communications, Inc.	-0.55	-0.54	-0.57	-0.37
SteelCloud Inc	-0.49	-0.67	-0.55	-0.43
Sun Microsystems Inc	0.48	-0.11	0.05	-0.36
Super Micro Computer Inc				
Web.com Inc	-0.02	0.32	-0.07	-0.57
XATA Corp.	-0.27	-0.38	-0.18	-0.21

Prime NAICS 334413
Semiconductor and Related Device Manufacturing
US Exchanges Only
12 month rolling average year to year adjusted stock price comparison
(% change = (A/B-1)%)

	A	9/07 -	9/07 -	9/07 -	9/07 -
	B	9/06	9/05	9/04	9/02
	Company	1 yr	2 yr	3 yr	5 yr
1	Actel Corp.	3%	-2%	-29%	-20%
2	Actielec Technologies (France)				
3	Actions Semiconductor Co Ltd				
4	Advanced Analogic Technologies	-32%			
5	Advanced Micro Devices, Inc.	-46%	-15%	7%	37%
6	Advanced Photonix, Inc.				
7	Advanced Semiconducter Eng.	30%	81%	54%	108%
8	AKN Technology BHD				
9	Alliance Fiber Optic Products (US)	37%	89%	40%	100%
10	Altera Corp. (United States)	13%	3%	1%	21%
11	AMIS Holdings Inc	11%	-15%	-34%	
12	Amkor Technology Inc.				
13	ANADIGICS, Inc.	82%	380%	125%	22%
14	Analog Devices, Inc.	2%	-2%	-18%	4%
15	Apogee Technology, Inc.	-2%	-61%	-90%	-84%
16	Applied Materials, Inc. (US)	12%	17%	-2%	1%
17	Applied Micro Circuits Corp.	5%	-1%	-40%	-58%
18	ASAT Holdings Ltd	-46%	-60%	-82%	-72%
19	Ascent Solar Technologies Inc				
20	ASE Test Ltd. (Singapore)	44%	101%	23%	14%
21	ASM International N.V.	42%	54%	24%	37%
22	Atheros Communications Inc	46%	154%		
23	Atmel Corp.	21%	94%	-4%	-16%
24	ATMI, Inc.	9%	17%	31%	33%
25	AuthenTec Inc				
26	Avanex Corp	13%	6%	-55%	-50%
27	AXT Inc	57%	237%	85%	-51%
28	Broadcom Corp.	-6%	39%	33%	67%
29	Brooks Automation Inc (New)	18%	3%	-21%	-51%
30	Cabot Microelectronics Corp	12%	9%	-14%	-37%
31	Cambridge Display Technology	-7%			
32	Catalyst Semiconductor, Inc.	-6%	-18%	-43%	50%
33	Cavium Networks Inc				
34	Ceva Inc	25%	8%	-12%	
35	Chartered Semiconductor Mfg. Ltd.	2%	27%	-1%	-58%
36	ChipMOS TECH. Bermuda	5%	6%	-17%	
37	Cirrus Logic, Inc.	-3%	32%	9%	-33%

38	Conexant Systems Inc.	-38%	-4%	-64%	-29%
39	Cree, Inc.	-14%	-23%	-2%	33%
40	Cypress Semiconductor Corp. (US)	33%	66%	25%	19%
41	DayStar Technologies Inc	-54%	-35%		
42	Diodes, Inc.	11%	102%	180%	1078%
43	DPAC Technologies Corp.	-6%	-76%	-91%	-96%
44	DSP Group, Inc. (United States)	-23%	-17%	-18%	11%
45	eMagin Corp (DE)	-76%	-88%	-93%	-86%
46	EMCORE Corp. (United States)	-25%	63%	53%	-25%
47	Epcos AG	40%	41%	-7%	-45%
48	ESS Technology, Inc.	-53%	-75%	-90%	-92%
49	Evergreen Solar Inc.	-25%	54%	249%	289%
50	Exar Corp.	1%	-7%	-18%	-30%
51	Fairchild Semiconductor Int.	-1%	17%	-13%	-21%
52	Finisar Corp (United States)	9%	147%	47%	-40%
53	First Solar Inc				
54	Focus Enhancements, Inc.	43%	30%	-32%	-9%
55	Formfactor Inc	11%	67%	100%	
56	Genesis Microchip Inc (DE)	-45%	-50%	-43%	-70%
57	GSI Technology Inc				
58	HEI Inc	-57%	-57%	-55%	-81%
59	Hi/fn Inc.	5%	-11%	-41%	-38%
60	Himax Technologies Inc				
61	Hittite Microwave Corp	19%			
62	Hologram Ind.Marne La Vallee (Fr.)				
63	Ibis Technology Corp.	-48%	-32%	-84%	-82%
64	Integrated Device Technology, Inc.	9%	36%	7%	-34%
65	Integrated Silicon Solution, Inc.	-4%	-20%	-56%	-39%
66	Intel Corp	8%	-6%	-17%	-9%
67	International Rectifier Corp.	1%	-16%	-15%	10%
68	Intersil Corp.	9%	59%	31%	13%
69	IPG Photonics Corp				
70	Irvine Sensors Corp.	-33%	-35%	-43%	1%
71	Isonics Corp.	-70%	-88%	-68%	-61%
72	IXYS Corp.	-4%	-10%	13%	30%
73	JA Solar Holdings Co Ltd				
74	Jazz Technologies Inc				
75	JDS Uniphase Corp	-30%	-8%	-48%	-63%
76	Kulicke & Soffa Industries, Inc.	6%	27%	-19%	-32%
77	Lattice Semiconductor Corp.	0%	17%	-27%	-58%
78	Leadis Technology Inc	-24%	-47%		
79	LightPath Technologies, Inc.	26%	52%	8%	-65%
80	Linear Technology Corp. (US)	-1%	-8%	-11%	1%
81	Logic Devices, Inc.	57%	70%	38%	48%
82	LogicVision Inc	-36%	-61%	-74%	
83	LSI Corp	-3%	26%	11%	-31%
84	Lumera Corp	45%	-12%		

85	Marvell Technology Group Ltd.	-29%	-6%	59%	147%
86	MathStar Inc	-48%			
87	Maxim Integrated Products, Inc.	-7%	-22%	-33%	-27%
88	Mellanox Technologies, Ltd.				
89	MEMC Elect. Materials, Inc. (US)	68%	275%	462%	1081%
90	Metalink Ltd.	24%	35%	-7%	78%
91	Micrel, Inc.	-2%	6%	-17%	-42%
92	Microchip Technology, Inc. (US)	9%	32%	28%	56%
93	Micromem Technologies, Inc.	-32%	-32%	67%	-34%
94	Micron Technology Inc.	-19%	11%	-12%	-49%
95	Micropac Industries, Inc.	-24%	8%	117%	283%
96	Microsemi Corp.	-16%	17%	72%	169%
97	Microtune Inc	-6%	-3%	46%	-60%
98	Mindspeed Technologies Inc	-23%	-4%	-64%	
99	MIPS Technologies, Inc. (US)	25%	-2%	47%	30%
100	Mirae Corp	-14%	-9%	-29%	-46%
101	Monolithic Power Systems Inc	8%			
102	MoSys Inc	13%	51%	4%	-37%
103	MRV Communications, Inc.	20%	17%	4%	30%
104	National Semiconductor Corp.	-1%	26%	32%	98%
105	NeoMagic Corp.	-17%	14%	-74%	-72%
106	Netlist Inc				
107	Netlogic Microsystems Inc	-12%	91%		
108	Nova Measuring Instruments Ltd	30%	-10%	-49%	-3%
109	NVE Corp	75%	51%	-23%	278%
110	NVIDIA Corp	62%	204%	281%	107%
111	OmniVision Technologies Inc	-26%	2%	-28%	249%
112	ON Semiconductor Corp	55%	118%	75%	303%
113	On Track Innovations (Israel)	-46%	-46%	-31%	
114	Opnext Inc				
115	OPTi, Inc.	122%	265%	285%	375%
116	Optical Communications Prod. Inc.	-30%	-16%	-43%	-26%
117	Optium Corp				
118	OSI Systems, Inc.	24%	39%	25%	23%
119	Pericom Semiconductor Corp.	20%	3%	-2%	-15%
120	Photronics, Inc.	-10%	-25%	-17%	-39%
121	Pixelplus Co Ltd				
122	Pixelworks Inc	-58%	-81%	-88%	-84%
123	PLX Technology Inc	3%	17%	8%	33%
124	PMC-Sierra Inc.	-16%	-24%	-53%	-50%
125	Power Integrations Inc.	22%	21%	-6%	38%
126	QLogic Corp.	-4%	0%	-7%	-16%
127	QuickLogic Corp	-31%	-13%	-22%	-25%
128	Rambus Inc. (DE)	-22%	15%	-21%	180%
129	Ramtron International Corp. (US)	36%	-2%	-7%	5%
130	REMEC Inc	93%			
131	RF Micro Devices, Inc. (US)	0%	19%	-19%	-54%

132	SatCon Technology Corp.	-30%	-32%	-51%	-63%
133	Semiconductor Manufacturing Int.	-7%	-35%		
134	Semtech Corp.	-8%	-18%	-32%	-47%
135	Sigmatel Inc	-59%	-87%	-85%	
136	Silicon Image Inc	-13%	-23%	-11%	58%
137	Silicon Laboratories Inc	-16%	12%	-26%	25%
138	Silicon Motion Technology Corp	44%			
139	Silicon Storage Technology, Inc.	-7%	-14%	-61%	-51%
140	Simtek Corp.	71%	-1%	-53%	57%
141	SIPEX Corp				
142	Sirenza Microdevices Inc	26%	160%	119%	158%
143	SiRf Technology Holdings Inc	-17%	55%		
144	Skyworks Solutions, Inc. (US)	31%	-5%	-23%	-46%
145	Solarfun Power Holdings Co Ltd				
146	Solitron Devices, Inc. (US)	-31%	94%	152%	479%
147	Spansion Inc				
148	Spatializer Audio Laboratories, Inc.				
149	SRS Labs, Inc.	83%	88%	55%	275%
150	Staktek Holdings Inc	-32%	9%		
151	Standard Microsystems Corp.	16%	53%	30%	72%
152	STATS ChipPac Ltd	46%	54%	1%	-14%
153	SunPower Corp				
154	Suntech Power Holdings Co Ltd				
155	Supertex, Inc.	0%	75%	114%	123%
156	Taiwan Semiconductor Mfg.	18%	43%	47%	18%
157	Techwell Inc	13%			
158	Tessera Technologies Inc	30%	15%		
159	Texas Instruments Inc.	5%	21%	26%	25%
160	Toshiba Ceramics Co., Ltd. (Jp)				
161	Tower Semiconductor Ltd.	18%	2%	-71%	-70%
162	Transmeta Corp. (Del)	-51%	-42%	-74%	-68%
163	TranSwitch Corp.	-17%	1%	-28%	-33%
164	Trident Microsystems, Inc.	-13%	75%	158%	853%
165	Trio-Tech International	128%	308%	301%	514%
166	Tripath Technology Inc				
167	TriQuint Semiconductor, Inc.	0%	33%	-22%	-51%
168	Ultra Clean Holdings Inc	71%	133%		
169	United Microelectronics C. (China)	8%	-4%	-22%	-47%
170	Varian Semiconductor Eq. Ass.	82%	122%	120%	158%
171	Verigy Ltd				
172	Vimicro International Corp				
173	Virage Logic Corp	-21%	-34%	-19%	-44%
174	Volterra Semiconductor Corp	-10%	-6%		
175	White Electronic Designs Corp.	9%	6%	-20%	-17%
176	WJ Communications Inc	-7%	-24%	-57%	-28%
177	Xilinx, Inc.	7%	-7%	-22%	-3%
178	Yingli Green Energy Holding Co.				

179	ZiLog, Inc. (United States)	50%	-9%	-57%	
180	Zoran Corp. (United States)	-12%	42%	-1%	-15%
	Count	**149**	**141**	**130**	**121**
	Median	**1%**	**6%**	**-12%**	**-15%**
	Mean	**3%**	**22%**	**7%**	**40%**
	Standard Deviation	**36%**	**73%**	**83%**	**190%**
	Standard Deviation from Mean				
	Actel Corp.	0.01	-0.34	-0.43	-0.32
	Actielec Technologies (France)				
	Actions Semiconductor Co Ltd				
	Advanced Analogic Technologies	-0.98			
	Advanced Micro Devices, Inc.	-1.37	-0.52	0.00	-0.02
	Advanced Photonix, Inc.				
	Advanced Semiconducter Eng.	0.75	0.81	0.56	0.36
	AKN Technology BHD				
	Alliance Fiber Optic Products (US)	0.96	0.92	0.39	0.31
	Altera Corp. (United States)	0.30	-0.26	-0.08	-0.10
	AMIS Holdings Inc	0.23	-0.51	-0.50	
	Amkor Technology Inc.				
	ANADIGICS, Inc.	2.21	4.91	1.42	-0.10
	Analog Devices, Inc.	-0.02	-0.33	-0.31	-0.19
	Apogee Technology, Inc.	-0.14	-1.15	-1.17	-0.66
	Applied Materials, Inc. (US)	0.26	-0.07	-0.12	-0.20
	Applied Micro Circuits Corp.	0.07	-0.32	-0.56	-0.52
	ASAT Holdings Ltd	-1.37	-1.13	-1.07	-0.59
	Ascent Solar Technologies Inc				
	ASE Test Ltd. (Singapore)	1.14	1.08	0.18	-0.14
	ASM International N.V.	1.08	0.43	0.20	-0.02
	Atheros Communications Inc	1.20	1.80		
	Atmel Corp.	0.51	0.98	-0.13	-0.30
	ATMI, Inc.	0.18	-0.07	0.29	-0.04
	AuthenTec Inc				
	Avanex Corp	0.28	-0.22	-0.75	
	AXT Inc	1.52	2.94	0.93	-0.48
	Broadcom Corp.	-0.24	0.23	0.31	0.14
	Brooks Automation Inc (New)	0.43	-0.26	-0.34	-0.48
	Cabot Microelectronics Corp	0.25	-0.18	-0.25	-0.41
	Cambridge Display Technology	-0.26			
	Catalyst Semiconductor, Inc.	-0.26	-0.55	-0.61	0.05
	Cavium Networks Inc				
	Ceva Inc	0.62	-0.20	-0.23	
	Chartered Semiconductor Mfg. Ltd.	-0.04	0.07	-0.10	-0.52
	ChipMOS TECH. Bermuda	0.05	-0.22	-0.29	
	Cirrus Logic, Inc.	-0.17	0.13	0.02	-0.38
	Conexant Systems Inc.	-1.13	-0.35	-0.86	-0.37
	Cree, Inc.	-0.46	-0.62	-0.11	-0.04
	Cypress Semiconductor Corp. (US)	0.85	0.60	0.21	-0.11

DayStar Technologies Inc	-1.60	-0.78		
Diodes, Inc.	0.22	1.10	2.08	5.47
DPAC Technologies Corp.	-0.25	-1.35	-1.18	-0.72
DSP Group, Inc. (United States)	-0.73	-0.54	-0.30	-0.15
eMagin Corp (DE)	-2.21	-1.51	-1.21	-0.67
EMCORE Corp. (United States)	-0.77	0.56	0.55	-0.34
Epcos AG	1.04	0.26	-0.17	-0.45
ESS Technology, Inc.	-1.55	-1.33	-1.17	-0.70
Evergreen Solar Inc.	-0.79	0.44	2.90	1.31
Exar Corp.	-0.05	-0.40	-0.31	-0.37
Fairchild Semiconductor Int.	-0.10	-0.08	-0.24	-0.32
Finisar Corp (United States)	0.16	1.71	0.47	-0.42
First Solar Inc				
Focus Enhancements, Inc.	1.13	0.10	-0.47	-0.26
Formfactor Inc	0.23	0.61	1.11	
Genesis Microchip Inc (DE)	-1.35	-0.98	-0.61	-0.58
GSI Technology Inc				
HEI Inc	-1.66	-1.08	-0.75	-0.64
Hi/fn Inc.	0.06	-0.46	-0.58	-0.41
Himax Technologies Inc				
Hittite Microwave Corp	0.44			
Hologram Ind.Marne La Vallee (Fr.)				
Ibis Technology Corp.	-1.43	-0.75	-1.10	-0.65
Integrated Device Technology, Inc.	0.18	0.19	0.00	-0.39
Integrated Silicon Solution, Inc.	-0.20	-0.58	-0.77	-0.42
Intel Corp	0.14	-0.38	-0.29	-0.26
International Rectifier Corp.	-0.06	-0.52	-0.26	-0.16
Intersil Corp.	0.17	0.51	0.29	-0.14
IPG Photonics Corp				
Irvine Sensors Corp.	-1.02	-0.79	-0.61	-0.21
Isonics Corp.	-2.05	-1.51	-0.90	-0.53
IXYS Corp.	-0.20	-0.45	0.07	-0.05
JA Solar Holdings Co Ltd				
Jazz Technologies Inc				
JDS Uniphase Corp	-0.92	-0.41	-0.67	-0.54
Kulicke & Soffa Industries, Inc.	0.08	0.06	-0.31	-0.38
Lattice Semiconductor Corp.	-0.07	-0.07	-0.41	-0.52
Leadis Technology Inc	-0.74	-0.95		
LightPath Technologies, Inc.	0.65	0.41	0.01	-0.56
Linear Technology Corp. (US)	-0.11	-0.42	-0.22	-0.21
Logic Devices, Inc.	1.50	0.66	0.37	0.04
LogicVision Inc	-1.09	-1.14	-0.97	
LSI Corp	-0.17	0.05	0.05	-0.37
Lumera Corp	1.18	-0.47		
Marvell Technology Group Ltd.	-0.89	-0.38	0.62	0.56
MathStar Inc	-1.42			
Maxim Integrated Products, Inc.	-0.28	-0.61	-0.49	-0.35

Mellanox Technologies, Ltd.				
MEMC Elect. Materials, Inc. (US)	1.81	3.47	5.46	5.49
Metalink Ltd.	0.59	0.18	-0.17	0.20
Micrel, Inc.	-0.13	-0.22	-0.29	-0.43
Microchip Technology, Inc. (US)	0.18	0.14	0.25	0.08
Micromem Technologies, Inc.	-0.98	-0.75	0.72	-0.39
Micron Technology Inc.	-0.60	-0.16	-0.23	-0.47
Micropac Industries, Inc.	-0.77	-0.20	1.32	1.28
Microsemi Corp.	-0.54	-0.07	0.78	0.68
Microtune Inc	-0.24	-0.34	0.47	-0.53
Mindspeed Technologies Inc	-0.73	-0.36	-0.86	
MIPS Technologies, Inc. (US)	0.61	-0.33	0.47	-0.05
Mirae Corp	-0.48	-0.43	-0.44	-0.45
Monolithic Power Systems Inc	0.14			
MoSys Inc	0.29	0.40	-0.04	-0.41
MRV Communications, Inc.	0.49	-0.07	-0.04	-0.05
National Semiconductor Corp.	-0.11	0.05	0.30	0.30
NeoMagic Corp.	-0.55	-0.11	-0.98	-0.59
Netlist Inc				
Netlogic Microsystems Inc	-0.42	0.94		
Nova Measuring Instruments Ltd	0.77	-0.44	-0.67	-0.23
NVE Corp	2.02	0.40	-0.36	1.25
NVIDIA Corp	1.65	2.49	3.29	0.35
OmniVision Technologies Inc	-0.81	-0.27	-0.42	1.10
ON Semiconductor Corp	1.46	1.31	0.81	1.39
On Track Innovations (Israel)	-1.37	-0.93	-0.47	
Opnext Inc				
OPTi, Inc.	3.34	3.33	3.33	1.76
Optical Communications Prod. Inc.	-0.91	-0.52	-0.61	-0.35
Optium Corp				
OSI Systems, Inc.	0.60	0.22	0.21	-0.09
Pericom Semiconductor Corp.	0.49	-0.27	-0.11	-0.29
Photronics, Inc.	-0.36	-0.64	-0.29	-0.42
Pixelplus Co Ltd				
Pixelworks Inc	-1.70	-1.42	-1.14	-0.65
PLX Technology Inc	0.02	-0.07	0.01	-0.04
PMC-Sierra Inc.	-0.52	-0.63	-0.73	-0.47
Power Integrations Inc.	0.54	-0.02	-0.16	-0.01
QLogic Corp.	-0.21	-0.31	-0.17	-0.30
QuickLogic Corp	-0.96	-0.49	-0.35	-0.34
Rambus Inc. (DE)	-0.69	-0.10	-0.33	0.74
Ramtron International Corp. (US)	0.92	-0.33	-0.17	-0.18
REMEC Inc	2.51			
RF Micro Devices, Inc. (US)	-0.08	-0.04	-0.31	-0.49
SatCon Technology Corp.	-0.93	-0.74	-0.70	-0.54
Semiconductor Manufacturing Int.	-0.27	-0.79		
Semtech Corp.	-0.30	-0.55	-0.47	-0.46

	Sigmatel Inc	-1.72	-1.50	-1.11	
	Silicon Image Inc	-0.44	-0.62	-0.22	0.09
	Silicon Laboratories Inc	-0.52	-0.14	-0.41	-0.08
	Silicon Motion Technology Corp	1.16			
	Silicon Storage Technology, Inc.	-0.27	-0.49	-0.82	-0.48
	Simtek Corp.	1.91	-0.32	-0.73	0.09
	SIPEX Corp				
	Sirenza Microdevices Inc	0.65	1.88	1.34	0.62
	SiRf Technology Holdings Inc	-0.55	0.45		
	Skyworks Solutions, Inc. (US)	0.79	-0.37	-0.36	-0.46
	Solarfun Power Holdings Co Ltd				
	Solitron Devices, Inc. (US)	-0.96	0.98	1.74	2.31
	Spansion Inc				
	Spatializer Audio Laboratories, Inc.				
	SRS Labs, Inc.	2.23	0.90	0.57	1.24
	Staktek Holdings Inc	-0.97	-0.18		
	Standard Microsystems Corp.	0.35	0.42	0.27	0.17
	STATS ChipPac Ltd	1.22	0.44	-0.07	-0.29
	SunPower Corp				
	Suntech Power Holdings Co Ltd				
	Supertex, Inc.	-0.09	0.73	1.28	0.44
	Taiwan Semiconductor Mfg.	0.42	0.29	0.47	-0.11
	Techwell Inc	0.29			
	Tessera Technologies Inc	0.77	-0.09		
	Texas Instruments Inc.	0.07	-0.01	0.22	-0.08
	Toshiba Ceramics Co., Ltd. (Jp)				
	Tower Semiconductor Ltd.	0.42	-0.28	-0.94	-0.58
	Transmeta Corp. (Del)	-1.51	-0.87	-0.98	-0.57
	TranSwitch Corp.	-0.54	-0.29	-0.43	-0.38
	Trident Microsystems, Inc.	-0.46	0.73	1.81	4.29
	Trio-Tech International	3.50	3.92	3.54	2.50
	Tripath Technology Inc				
	TriQuint Semiconductor, Inc.	-0.07	0.15	-0.36	-0.48
	Ultra Clean Holdings Inc	1.90	1.52		
	United Microelectronics C. (China)	0.13	-0.36	-0.35	-0.46
	Varian Semiconductor Eq. Ass.	2.22	1.37	1.36	0.62
	Verigy Ltd				
	Vimicro International Corp				
	Virage Logic Corp	-0.66	-0.77	-0.31	-0.44
	Volterra Semiconductor Corp	-0.35	-0.39		
	White Electronic Designs Corp.	0.17	-0.22	-0.33	-0.30
	WJ Communications Inc	-0.27	-0.63	-0.77	-0.36
	Xilinx, Inc.	0.11	-0.40	-0.36	-0.23
	Yingli Green Energy Holding Co.				
	ZiLog, Inc. (United States)	1.31	-0.42	-0.77	
	Zoran Corp. (United States)	-0.42	0.28	-0.10	-0.29

Appendix H: NAICS Codes and Companies per Code

NAICS Codes:
Publicly Traded Companies - Mergent Online (11/4/08 - 11/11/08)
US Exchange Only - United States - Any Index

Total 19,720 6-Digit Codes

2-Digit Category	2-Digit Code # Companies	4-Digit Code	4-Digit Code # Companies	3-Digit Code # Companies	3-Digit Category
Agriculture, Forestry	46	1111	6	17	Crop Production (111)
		1112	1		
		1113	4		
		1114	3		
		1119	3		
		1121	1	9	Animal Production (112)
		1122	1		
		1123	2		
		1124			
		1125	2		
		1129	3		
		1131	4	6	Forestry and Logging (113)
		1132	2		
		1133			
		1141	2	2	Fishing, Hunting and Trapping (114)
		1142			
		1151	7	12	Support Activities for Agriculture & Forestry (115)
		1152	2		
		1153	3		
Mining (21)	655	2111	292	292	Oil and Gas Extraction (211)
		2121	23	208	Mining (except Oil and Gas - 212))
		2122	157		
		2123	28		
		2131	155	155	Support Activities for Mining (213)
Utilities (22)	274	2211	174	274	Utilities (221)
		2212	69		
		2213	31		
Construction (23)	133	2361	43	55	Construction of Buildings (236)
		2362	12		
		2371	29	59	Heavy and Civil Engineering Construction (237)
		2372	25		
		2373	4		
		2379	1		
		2381	3	19	Specialty Trade Contractors (238)
		2382	13		
		2383	3		
		2389			
Manufacturing (31)	336	3111	3	142	Food Manufacturing (311)
		3112	16		
		3113	11		
		3114	20		
		3115	15		
		3116	25		
		3117	1		
		3118	17		
		3119	34		
		3121	49	62	Beverage & Tobacco Product Manufacturing (312)
		3122	13		
		3131	1	21	Textile Mills (313)
		3132	17		
		3133	3		

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Publicly Traded Companies - Mergent Online (11/4/08 - 11/11/08)
US Exchange Only - United States - Any Index

Total 19,720 6-Digit Codes

2-Digit Category	2-Digit Code # Companies	4-Digit Code	4-Digit Code # Companies	3-Digit Code # Companies	3-Digit Category
		3141	8	12	Textile Product Mills (314)
		3149	4		
		3151	2	66	Apparel Manufacturing (315)
		3152	51		
		3159	13		
		3161		33	Leather and Allied Product Manufacturing (316)
		3162	28		
		3169	5		
Manufacturing (32)	1,159	3211	4	29	Wood Product Manufacturing (321)
		3212	5		
		3219	20		
		3221	38	71	Paper Manufacturing (322)
		3222	33		
		3231	42	42	Printing and Related Support Activities (323)
		3241	52	52	Petroleum and Coal Products Manufacturing (324)
		3251	55	844	Chemical Manufacturing (325)
		3252	26		
		3253	29		
		3254	631		
		3255	19		
		3256	53		
		3259	31		
		3261	60	73	Plastics and Rubber Products Manufacturing (326)
		3262	13		
		3271	9	48	Nonmetallic Mineral Product Manufacturing (327)
		3272	10		
		3273	15		
		3274	2		
		3279	12		
Manufacturing (33)	2,474	3311	31	98	Primary Metal Manufacturing (331)
		3312	14		
		3313	12		
		3314	25		
		3315	16		
		3321	12	120	Fabricated Metal Product Manufacturing (332)
		3322	8		
		3323	23		
		3324	11		
		3325	7		
		3326	2		
		3327	8		
		3328	9		
		3329	40		
		3331	59	329	Machinery Manufacturing (333)
		3332	58		
		3333	86		
		3334	34		
		3335	18		
		3336	22		
		3339	52		
		3341	213	1,244	Computer and Electronic Product

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US Exchange Only - United States - Any Index

Total 19,720 6-Digit Codes

2-Digit Category	2-Digit Code # Companies	4-Digit Code	4-Digit Code # Companies	3-Digit Code # Companies	3-Digit Category
		3342	274		Manufacturing (334)
		3343	17		
		3344	331		
		3345	369		
		3346	40		
		3351	25	133	Electrical Equipment, Appliance, and Component Manufacturing (335)
		3352	12		
		3353	28		
		3359	68		
		3361	6	176	Transportation Equipment Manufacturing (336)
		3362	22		
		3363	69		
		3364	50		
		3365	5		
		3366	10		
		3369	14		
		3371	22	35	Furniture and Related Product Manufacturing (337)
		3372	11		
		3379	2		
		3391	247	339	Miscellaneous Manufacturing (339)
		3399	92		
Wholesale (42)	428	4231	24	288	Merchant Wholesalers, Durable Goods (423)
		4232	4		
		4233	16		
		4234	102		
		4235	15		
		4236	55		
		4237	7		
		4238	37		
		4239	28		
		4241	10	138	Merchant Wholesalers, Nondurable Goods (424)
		4242	27		
		4243	7		
		4244	31		
		4245	6		
		4246	22		
		4247	13		
		4248	2		
		4249	20		
		4251	2	2	Wholesale Electronic Markets and Agents and Brokers (425)
Retail Trade (44)	305	4411	9	43	Motor Vehicle and Parts Dealers (441)
		4412	20		
		4413	14		
		4421	12	20	Furniture and Home Furnishings Stores (442)
		4422	8		
		4431	31	48	Electronics and Appliance Stores (443)
		4441	13		
		4442	4		
		4451	37	43	Food and Beverage Stores (445)
		4452	6		

NAICS Codes:
Publicly Traded Companies - Mergent Online (11/4/08 - 11/11/08)
US Exchange Only - United States - Any Index

Total 19,720 6-Digit Codes

2-Digit Category	2-Digit Code # Companies	4-Digit Code	4-Digit Code # Companies	3-Digit Code # Companies	3-Digit Category
		4453			
		4461	57	57	Health and Personal Care Stores (446)
		4471	7	7	Gasoline Stations (447)
		4481	66	87	Clothing and Clothing Accessories Stores (448)
		4482	9		
		4483	12		
Retail Trade (45)	203	4511	29	44	Sporting Goods, Hobby, Book, Music Stores (451)
		4512	15		
		4521	20	49	General Merchandise Stores (452)
		4529	29		
		4531	4	39	Miscellaneous Store Retailers (453)
		4532	9		
		4533			
		4539	26		
		4541	61	71	Nonstore Retailers (454)
		4542	1		
		4543	9		
Transportation and \	239	4811	29	38	Air Transportation (481)
		4812	9		
		4821	18	18	Rail Transportation (182)
		4831	15	20	Water Transportation (483)
		4832	5		
		4841	43	53	Truck Transportation (484)_
		4842	10		
		4851		4	Transit and Ground Passenger Transportation (485)
		4852			
		4853	1		
		4854	1		
		4855	1		
		4859	1		
		4861	5	62	Pipeline Transportation (486)
		4862	45		
		4869	12		
		4871		1	Scenic and Sightseeing Transportation (487)
		4872	1		
		4879			
		4881	6	43	Support Activities for Transportation (488)
		4882	2		
		4883	8		
		4884	2		
		4885	16		
		4889	9		
Transportation and \	17	4911			
		4921	7	7	Couriers and Messengers (492)
		4922			
		4931	10	10	Warehousing and Storage (493)
Information (51)	1,003	5111	77	502	Publishing Industries (except Internet - 511))
		5112	425		
		5121	67	72	Motion Picture and Sound Recording Industries (512)
		5122	5		
		5151	47	60	Broadcasting (except Internet - 515))

NAICS Codes:
Publicly Traded Companies - Mergent Online (11/4/08 - 11/11/08)
US Exchange Only - United States - Any Index

Total 19,720 6-Digit Codes

2-Digit Category	2-Digit Code # Companies	4-Digit Code	4-Digit Code # Companies	3-Digit Code # Companies	3-Digit Category
		5152	13		
		5171	138	263	Telecommunications (517)
		5172	72		
		5174	14		
		5179	39		
		5182	96	96	Data Processing, Hosting and Related Services
		5191	10	10	Other Information Services (519)
Finance and Insurar	3,573	5211			
		5221	1,484	1,628	Credit Intermediation and Related Activities (522)
		5222	96		
		5223	48		
		5231	121	342	Securities, Commodity Contracts, and Other Financial Investments and Related Activities (523)
		5232	8		
		5239	213		
		5241	250	300	Insurance Carriers and Related Activities (524)
		5242	50		
		5251	5	1,303	Funds, Trusts, and Other Financial Vehicles (525)
		5259	1,298		
Real Estate and Rei	202	5311	64	97	Real Estate (531)
		5312	13		
		5313	20		
		5321	9	64	Rental and Leasing Services (532)
		5322	19		
		5323	3		
		5324	33		
		5331	41	41	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works - 533)
Professional, Scient	850	5411	3	850	Professional, Scientific, and Technical Services (541)
		5412	6		
		5413	67		
		5414	14		
		5415	478		
		5416	80		
		5417	91		
		5418	83		
		5419	28		
Management of Cor	326	5511	326	326	Management of Companies and Enterprises (551)
Administrative and S	358	5611	25	296	Administrative and Support Services (561)
Mangment and Remediation Servi		5612	10		
		5613	49		
		5614	111		
		5615	27		
		5616	31		
		5617	8		
		5619	35		
		5621	3	62	Waste Management &Remediation Services (562)
		5622	35		
		5629	24		
Educational Service	45	6111	2	45	Educational Services (611)
		6112	1		

NAICS Codes:
Publicly Traded Companies - Mergent Online (11/4/08 - 11/11/08)
US Exchange Only - United States - Any Index

Total 19,720 6-Digit Codes

2-Digit Category	2-Digit Code # Companies	4-Digit Code	4-Digit Code # Companies	3-Digit Code # Companies	3-Digit Category
		6113	8		
		6114	6		
		6115	10		
		6116	10		
		6117	8		
Health Care and So	252	6211	9	166	Ambulatory Health Care Services (621)
		6212	3		
		6213	3		
		6214	37		
		6215	52		
		6216	37		
		6219	25		
		6221	21	27	Hospitals (622)
		6222	4		
		6223	2		
		6231	32	48	Nursing and Residential Care Facilities (623)
		6232			
		6233	14		
		6239	2		
		6241	3	11	Social Assistance (624)
		6242			
		6243			
		6244	8		
Arts, Entertainment,	110	7111	4	28	Performing Arts, Spectator Sports, and Related Industries (711)
		7112	22		
		7113			
		7114	1		
		7115	1		
		7121			
		7131	10	82	Amusement, Gambling, & Recreation Industries
		7132	36		
		7139	36		
Accomodation and F	210	7211	65	66	Accommodation (721)
		7212	1		
		7213			
		7221	88	144	Food Services and Drinking Places (722)
		7222	41		
		7223	8		
		7224	7		
Other Services (except Public Admin - 81)	73	8111	5	16	Repair and Maintenance (811)
		8112	6		
		8113	2		
		8114	3		
		8121	6	46	Personal and Laundry Services (812)

NAICS Codes:
Publicly Traded Companies - Mergent Online (11/4/08 - 11/11/08)
US Exchange Only - United States - Any Index

Total 19,720 6-Digit Codes

2-Digit Category	2-Digit Code # Companies	4-Digit Code	4-Digit Code # Companies	3-Digit Code # Companies	3-Digit Category
		8122	7		
		8123	9		
		8129	24		
		8131		11	Religious, Grantmaking, Civic, Professional, and Similar Organizations (813)
		8132	1		
		8133			
		8134	1		
		8139	9		
		8141			
Public Administration (92)	15	9211	5	15	Public Administration (92)
		9221	3		
		9231	1		
		9241	3		
		9251	1		
		9261			
		9271	1		
		9281	1		
Total	13,286		13,286	13,286	Note Zero Count Categories Deleted
Max	3,573		1,484	1,628	
Min	15		1	1	
Count	24		289	87	
Average	554		46	153	
Standard Deviation	834.53		134.13	282.22	

Appendix I: Random NAICS Category Start Number for Company Selection

3-Digit Code	1/11/2009 Downloaded 3-Digit Code Active # Companies	1/14/2009 Estimated 5% Sample Number of Companies	Pilot Test Actual 5% Number of Companies	Start Number: 1/14/2009 Pilot Test Random* 1 - 20 Copy/Paste as Value	Start Number: 2/11/2009 Double Sample Size	Process Documentation: Random* 1 - 20 Rand *19+1	Process Documentation: RAND Fn
111	8			16	6	11	0.536697472
112	6			4	14	5	0.184321559
				14		16	0.764015049
				3		19	0.94891696
				5		19	0.927198522
				5		5	0.191381449
				6		9	0.406593502
113	3			5	15	15	0.749525228
				10		9	0.411829421
				16		6	0.253889796
114	1			13	3	19	0.966346827
				14		15	0.731506797
115	9			12	2	20	0.999142892
		0	0	11	1	2	0.074318858
		0	0	7		14	0.694982015
211	175	8	9	8	18	10	0.462230986
212	181	9	9	11	1	9	0.428039959
		0	0	7		2	0.057550247
		0	0	14		11	0.510717346
213	124	6	6	6	16	5	0.206301447
221	170	8	8	15	5	9	0.402904044
		0	0	16		6	0.273422426
		0	0	13		3	0.116637585
236	33	1	2	9	19	9	0.436742446
		0	0	10		9	0.401979349
237	32	1	2	11	1	10	0.483368327
		0	0	18		9	0.403025315
		0	0	5		2	0.058109058
		0	0	19		10	0.485186925
238	12			1	11	7	0.330239601
		0	0	12		9	0.435309834
		0	0	17		3	0.11564967
		0	0	5		2	0.078857506
311	92	4	5	8	18	9	0.429972917
		0	0	15		7	0.338229887
		0	0	5		9	0.443573475
		0	0	18		4	0.176279765
		0	0	6		18	0.879994469
		0	0	18		10	0.489973319
		0	0	12		12	0.60389755
		0	0	11		4	0.160895019
		0	0	3		4	0.168006138

3-Digit Code	1/11/2009 Downloaded 3-Digit Code Active # Companies	1/14/2009 Estimated 5% Sample Number of Companies	Pilot Test Actual 5% Number of Companies	Start Number 1/14/2009 Pilot Test Random* 1 - 20 Copy/Paste as Value	Start Number 2/11/2009 Double Sample Size	Process Documentation Random* 1 - 20 Rand *19+1	Process Documentation RAND Fn
312	39	1	2	11	1	12	0.567551403
		0	0	12		12	0.594991937
313	8			11	1	18	0.911321301
		0	0	4		13	0.625969301
		0	0	15		12	0.586032024
314	6			11	1	16	0.786959165
		0	0	10		5	0.231099978
315	38	1	2	12	2	7	0.330055953
		0	0	16		11	0.549281394
		0	0	17		14	0.659768668
316	20	1	1	15	5	18	0.905695158
		0	0	10		17	0.861243951
		0	0	5		11	0.500542427
321	13			8	18	10	0.47672296
		0	0	7		18	0.908654962
		0	0	19		18	0.868960538
322	34	1	2	12	2	14	0.679117226
		0	0	14		20	0.99882046
323	16			19	9	5	0.198046567
324	33	1	1	16	6	15	0.720982328
325	559	27	28	3	13	3	0.09124787
		0	0	9		16	0.763850473
		0	0	8		14	0.709130137
		0	0	14		4	0.136648831
		0	0	14		14	0.683961411
		0	0	9		10	0.497063516
		0	0	8		13	0.646827794
326	37	1	2	2	12	18	0.876233163
				8		2	0.036095513
327	25	1	1	14	4	7	0.310079336
				20		9	0.442769203
		0	0	4		11	0.541288818
		0	0	11		12	0.559827441
		0	0	16		1	0.014485177
331	52	2	2	15	5	15	0.754259724
		0	0	1		6	0.269498482
		0	0	14		15	0.719696426
		0	0	18		6	0.267926719
		0	0	16		8	0.391394187
332	66	3	4	5	15	19	0.953541941
				3		14	0.662461536
		0	0	16		9	0.424806218
		0	0	15		12	0.563074404
		0	0	6		9	0.439176806
		0	0	8		7	0.32841575
		0	0	2		20	0.981691603

				Start Number		Process Documentation	
3-Digit Code	1/11/2009 Downloaded 3-Digit Code Active # Companies	1/14/2009 Estimated 5% Sample Number of Companies	Pilot Test Actual 5% Number of Companies	1/14/2009 Pilot Test Random* 1 - 20 Copy/Paste as Value	2/11/2009 Double Sample Size	Random* 1 - 20 Rand *19+1	RAND Fn
		0	0	12		14	0.685668211
		0	0	19		19	0.944179106
333	168	8	8	18	8	7	0.327968173
		0	0	8		20	0.977166408
		0	0	17		15	0.747073793
		0	0	10		7	0.308863121
		0	0	8		18	0.89236727
		0	0	2		8	0.349418378
		0	0	3		20	0.990971589
334	681	34	34	15	5	9	0.409302059
				8		6	0.278323742
		0	0	9		5	0.232941362
		0	0	9		6	0.249548204
		0	0	8		11	0.54968404
		0	0	12		10	0.452275103
335							
	79	3	4	5	15	3	0.099659565
				15		9	0.438793602
		0	0	1		9	0.429999829
		0	0	14		13	0.606234232
336	110	5	5	18	8	20	0.978075362
		0	0	4		3	0.084955361
		0	0	18		20	0.977560454
		0	0	3		15	0.762082686
		0	0	14		4	0.182872224
		0	0	8		9	0.442262294
		0	0	13		16	0.785162185
337	20	1	1	12	2	18	0.871591012
				18		18	0.914606081
		0	0	2		17	0.862679088
339	189	9	9	13	3	3	0.099843308
		0	0	6		13	0.608621056
423	140	7	7	5	15	13	0.657017386
		0	0	13		16	0.772536423
		0	0	1		11	0.54483408
		0	0	11		12	0.577997722
		0	0	14		15	0.73377042
		0	0	18		15	0.746669435
		0	0	12		10	0.492529055
		0	0	20		15	0.75941756
		0	0	12		1	0.013738312
424							
	63	3	3	17	7	12	0.584308674
		0	0	13		9	0.397107958
		0	0	8		8	0.384574686
		0	0	5		16	0.799759904

3-Digit Code	1/11/2009 Downloaded 3-Digit Code Active # Companies	1/14/2009 Estimated 5% Sample Number of Companies	Pilot Test Actual 5% Number of Companies	Start Number 1/14/2009 Pilot Test Random* 1 - 20 Copy/Paste as Value	Start Number 2/11/2009 Double Sample Size	Process Documentation Random* 1 - 20 Rand *19+1	Process Documentation RAND Fn
		0	0	10		2	0.038085854
		0	0	14		4	0.177927906
		0	0	3		17	0.849491615
		0	0	1		12	0.587515815
		0	0	11		7	0.329820269
425							
	2			15	5	12	0.557356032
441	32	1	2	7	17	4	0.172818971
		0	0	13		19	0.928438239
		0	0	19		16	0.766308453
442	8			15	5	7	0.338124648
		0	0	13		13	0.607576755
443	12			16	6	4	0.13325479
		0	0	11		6	0.255604844
		0	0	12		12	0.573116566
445	17			17	7	18	0.874981548
		0	0	9		9	0.43316262
		0	0	12		16	0.81457636
446	25	1	1	12	2	13	0.655593346
447	3			1	11	13	0.611987597
448	61	3	3	5	15	6	0.27812474
		0	0	11		2	0.052523773
		0	0	3		11	0.508373371
451							
	19			14	4	8	0.384190088
		0	0	3		5	0.211915026
452	25	1	2	4	14	11	0.535155318
		0	0	4		6	0.280502892
453	19			7	17	10	0.463592581
		0	0	5		7	0.322730907
		0	0	18		15	0.714407959
		0	0	4		15	0.748154574
454	28	1	1	12	2	13	0.618374859
		0	0	18		4	0.168763454
		0	0	18		14	0.702971978
481	25	1	2	1	11	13	0.612452627
		0	0	16		12	0.569853525
482	7			16	6	1	0.010910478
483	15			14	4	2	0.048039372
		0	0	7		7	0.296353413
484	24	1	1	5	15	18	0.910975476
		0	0	6		10	0.465606591
485							
	1			13	3	12	0.598125993
		0	0	1		12	0.560374779
		0	0	19		15	0.724849857

3-Digit Code	1/11/2009 Downloaded 3-Digit Code Active # Companies	1/14/2009 Estimated 5% Sample Number of Companies	Pilot Test Actual 5% Number of Companies	Start Number 1/14/2009 Pilot Test Random* 1 - 20 Copy/Paste as Value	Start Number 2/11/2009 Double Sample Size	Process Documentation Random* 1 - 20 Rand *19+1	Process Documentation RAND Fn
		0	0	8		5	0.229788515
		0	0	9		15	0.738464473
		0	0	15		18	0.87321543
486	46	2	2	16	6	18	0.914887382
		0	0	11		11	0.544625507
		0	0	16		11	0.503333633
487	1			5	15	14	0.681490662
		0	0	13		11	0.509347864
		0	0	11		5	0.1934796
488	22	1	1	10	20	15	0.757794204
		0	0	17		16	0.765421631
		0	0	3		18	0.919026203
		0	0	16		5	0.211233453
		0	0	17		1	0.001164389
		0	0	9		11	0.536542236
				7		13	0.657073777
492	6			3	13	13	0.607368257
		0	0	18		2	0.042536101
493	1			2	12	14	0.672332297
511	226	11	11	13	3	3	0.11099879
		0	0	8		19	0.970156988
512	35	1	2	10	20	20	0.997004224
		0	0	2		12	0.578916841
515	41	2	2	3	13	3	0.105392357
		0	0	18		6	0.288079809
517	121	6	6	16	6	9	0.421985093
		0	0	14		15	0.747526828
		0	0	14		13	0.621831436
		0	0	1		15	0.72461786
518	61	3	3	15	5	10	0.456480805
519	8			14	4	17	0.842810811
				9		20	0.993399352
522							
	727	36	37	1	11	18	0.915140058
		0	0	9		2	0.067631144
		0	0	8		10	0.449611645
523							
	244	12	12	19	9	15	0.758953084
		0	0	14		8	0.388942391
		0	0	6		10	0.450454185
524	139	6	7	6	16	2	0.067677797
		0	0	3		6	0.271394661
525							
	839	41	42	5	15	12	0.558853643
		0	0	19		4	0.1685274

				Start Number		Process Documentation	
3-Digit Code	1/11/2009 Downloaded 3-Digit Code Active # Companies	1/14/2009 Estimated 5% Sample Number of Companies	Pilot Test Actual 5% Number of Companies	1/14/2009 Pilot Test Random* 1 - 20 Copy/Paste as Value	2/11/2009 Double Sample Size	Random* 1 - 20 Rand *19+1	RAND Fn
531	49	2	3	2	12	20	0.999939603
		0	0	11		19	0.970252847
		0	0	14		19	0.958506154
532	32	1	1	16	6	2	0.041712358
		0	0	18		16	0.785725584
		0	0	13		18	0.885207637
		0	0	14		6	0.240330204
533							
	24	1	1	14	4	10	0.478395062
541	389	19	19	12	2	10	0.479945862
		0	0	7		5	0.21754372
		0	0	13		13	0.644693326
		0	0	16		8	0.364889893
		0	0	13		2	0.029749768
		0	0	3		20	0.992277231
		0	0	15		4	0.157510188
		0	0	19		4	0.164477611
		0	0	15		18	0.914290163
551							
	118	5	6	17	7	18	0.90381749
561	182	9	9	12	2	5	0.185115228
				17		4	0.132499288
		0	0	17		11	0.527488318
		0	0	8		7	0.301445833
		0	0	2		7	0.309637558
		0	0	13		12	0.56396644
		0	0	4		6	0.266331094
		0	0	7		7	0.305696103
562							
	32	1	1	16	6	19	0.960829246
		0	0	19		2	0.040279825
		0	0	8		15	0.72509428
611	29	1	1	20	10	19	0.947791655
		0	0	10		15	0.745351493
		0	0	9		7	0.326974798
		0	0	2		19	0.935474959
		0	0	17		15	0.722461052
		0	0	10		9	0.403770033
		0	0	6		7	0.290990659
621	78	3	4	10	20	15	0.722398755
		0	0	3		12	0.585861601
		0	0	8		12	0.555557874
		0	0	14		13	0.608384887
		0	0	15		17	0.827984041
		0	0	16		14	0.68495479
		0	0	19		17	0.841303071

				Start Number		Process Documentation	
3-Digit Code	1/11/2009 Downloaded 3-Digit Code Active # Companies	1/14/2009 Estimated 5% Sample Number of Companies	Pilot Test Actual 5% Number of Companies	1/14/2009 Pilot Test Random* 1 - 20 Copy/Paste as Value	2/11/2009 Double Sample Size	Random* 1 - 20 Rand *19+1	RAND Fn
622	13			9	19	4	0.137131374
		0	0	8		6	0.266620927
		0	0	7		7	0.299948577
623	17			19	9	10	0.463923708
		0	0	9		19	0.96432466
		0	0	18		12	0.587222557
		0	0	8		4	0.179915064
624	2			18	8	18	0.871801069
		0	0	3		11	0.503581597
		0	0	15		15	0.716114866
		0	0	8		15	0.726258506
711							
	17			6	16	20	0.975093729
		0	0	9		17	0.848207618
		0	0	15		14	0.6633454
		0	0	15		9	0.399721101
		0	0	8		16	0.797431819
		0	0	17		6	0.281309713
713	51	2	2	19	9	5	0.219481571
		0	0	4		7	0.339763221
		0	0	15		14	0.708881111
721	25	1	2	4	14	12	0.575408411
		0	0	7		8	0.394444076
		0	0	17		18	0.877974718
722	71	3	4	4	14	16	0.807299835
		0	0	13		6	0.262252373
		0	0	1		17	0.847966812
		0	0	13		14	0.687601481
		0	0	12		10	0.472330554
		0	0	6		10	0.482131079
		0	0	8		11	0.545725619
		0	0	5		2	0.06448516
		0	0	3		4	0.180789657
811	8			2	12	1	0.024927115
		0	0	3		11	0.538943163
		0	0	4		18	0.900070707
		0	0	14		8	0.368467495
812	30	1	2	6	16	12	0.599305006
		0	0	19		6	0.239478593
		0	0	7		11	0.54549091
		0	0	10		17	0.851779681
813							
	9			15	5	11	0.519847239
		0	0	11		6	0.285734241
		0	0	4		4	0.162975058

3-Digit Code	1/11/2009 Downloaded 3-Digit Code Active # Companies	1/14/2009 Estimated 5% Sample Number of Companies	Pilot Test Actual 5% Number of Companies	Start Number		Process Documentation	
				1/14/2009 Pilot Test Random* 1 - 20 Copy/Paste as Value	2/11/2009 Double Sample Size	Random* 1 - 20 Rand *19+1	RAND Fn
		0	0	11		20	0.974255015
		0	0	11		10	0.477587187
		0	0	9		8	0.368361481
920	10	0	0	6	16	8	0.378275268

Total	7,268	325	349
Max	839		
Min	1		
Count	87		
Aferage	84		
Std.Dev.	153.46		

Appendix J: Pilot Test Email Campaign

Survey e-mail Campaign model based on Dillman, D. (2000). *Mail and Internet Surveys: The Tailored Design Method* (2nd ed.). New York: John Wiley & Sons, Inc. (pp. 156 – 185).

Scheduled as follows:
Week 1 -- (02/24/09) Tue 1st Contact Email Prior Letter
Week 1 -- (02/27/09) Fr 2nd Contact Survey Cover Letter
Week 3 -- (03/09/09) Mon 3rd Contact E-mail Thank You/Reminder
Week 5 -- (03/23/09) Mon 4th Contact Repeat Questionnaire
Week 10 -- (04/27/09) Mon 5th Final Contact

1st Contact Email prior letter

Date:	2/24/09
To:	Contact, Title Company
From:	Robert Fowke, Portland State University
Subject:	Ph.D. Dissertation Survey

Your company is one of a set of publicly traded companies that has been selected to participate in a brief survey regarding performance measures for managerial decision making, in partial fulfillment of the requirements for a Ph.D. in Systems Science: Business Administration. Multiple participants, who will remain anonymous, are welcome from each selected company (coded for anonymity).

Within the next couple of days you will be receiving the brief survey from this same email address. We would greatly appreciate it if you could take a few moments to complete it. By doing so you will help ensure that we have the best information possible. If you have any questions, or if a different contact should be used for the email survey distribution, please advise rfowke@pdx.edu using Company Code 9999.999.

Thank you in advance for your cooperation.

Sincerely,

Robert Fowke, Ph.D. Candidate
Portland State University

2nd Contact Survey Cover Letter

Date:	2/27/09
To:	Contact, Title Company
From:	Robert Fowke
Subject:	Ph.D. Dissertation Survey Request

As mentioned previously your company is one of set of publicly traded companies that has been selected to participate in a brief 12 question survey regarding performance measures in partial fulfillment of the requirements for a Ph.D. in Systems Science: Business Administration.

This study accommodates responses from a variety of job functions and departments. Multiple participants, who will remain anonymous, are therefore welcome from each selected company. Please ask interested participants to use company code 9999.999 when completing this questionnaire to assure company anonymity.

[Insert survey link]

Results of the survey will be made available to participants upon request.

Thank you in advance for your consideration and participation.

Sincerely,

Robert Fowke, Ph.D. Candidate
Portland State University

3rd Contact E-mail thank you/reminder

Date:	3/9/09
To:	Contact, Title
	Company
From:	Robert Fowke
Subject:	Ph.D. Dissertation Survey Request

About a week ago we sent you a survey via e-mail. Your company was randomly selected from a set of publicly traded companies for participation.

If you have already completed the questionnaire, please accept our sincere thanks. If not, please do so today using Company Code 9999.999. The questionnaire is a very brief 12 question questionnaire that will help define synergies in multi-attribute performance measurement systems. If additional personnel in your company would like to participate please ask them to do so using the same Company Code 9999.999.

Please find the survey link included in this message for your convenience:

[insert survey link]

Thank you in advance for your consideration and participation.

Sincerely,

Robert Fowke, Ph.D. Candidate
Portland State University

4th Contact Repeat Questionnaire

Date: 3/23/09
To: Contact, Title
Company
From: Robert Fowke
Subject: Ph.D. Dissertation Survey Request

About three weeks ago I sent you a brief 12 question survey request about your company's use of performance measurements. To the best of our knowledge, no one from your company has yet participated.

The comments of people who have already responded include a wide variety of measurement systems. We think the results are going to be very useful to define synergies in multi-attribute performance measurement systems.

We are writing again because of the importance that your questionnaire has for helping to get accurate results. Although we sent questionnaires to a random selection of publicly traded companies, it's only by hearing from nearly everyone in the sample that we can be sure that the results are truly representative.

A few people have written to advise that they are not the appropriate company contact. If this is the case, please advise rfowke@pdx.edu of the best contact for your company (Company Code 9999.999).

A comment on our survey procedures: Individual names are not included in the survey response, and so remain anonymous. As noted above, the company is also coded for confidentiality. Protecting the confidentiality of people's answers is very important to us, as well as the University.

We hope you will fill out and return the questionnaire soon. Please find the survey link included in this message for your convenience:

[insert survey link]

Sincerely,

Robert Fowke, Ph.D. Candidate
Portland State University

P. S. If you have concerns or problems about your participation in this study or your rights as a research subject, please contact the Human Subjects Research Review Committee, Office of Research and sponsored Projects, 111 Cramer Hall, Portland State University, (503) 725-4288 / 1-877-480-4400. If you have questions about the study itself, contact Robert Fowke at Portland State University, c/o Dr. Beverly Fuller, SBA.

5^{th} Final Contact

Date: 4/27/09
To: Contact, Title
Company
From: Robert Fowke
Subject: Ph.D. Dissertation Survey Request

During the last two months we have sent you several email requests about a research study we are conducting in partial fulfillment of the requirements for a Ph.D. in Systems Science: Business Administration.

The purpose is to help define synergies in multi-attribute performance measurement systems among publicly traded companies.

The study is drawing to a close and this is the last contact that will be made to the random selection of companies.

We are sending this final contact because of our concern that people who have not responded may utilize different performance measurement systems than those who have responded. Hearing from everyone in this small sample survey helps assure that the survey results are as accurate as possible.

We also want to assure you that your response to this study is voluntary, and if you prefer not to respond that is fine.

Finally, we appreciate your willingness to consider our request as we conclude this effort to better understand performance measurement system synergies in publicly traded companies.

We hope you will take the opportunity fill out and submit the brief 12 question questionnaire using Company code 9999.999:

[insert survey link]

Sincerely,

Robert Fowke, Ph.D. Candidate
Portland State University

Appendix K: Dissertation Survey Email Campaign

Date: 09/10/09

To: Beverly Fuller
Dissertation Committee Member
Portland State University

From: Robert Fowke
Portland State University

Your company is one of a set of publicly traded companies that has been selected to participate in a brief 3 - 5 minute survey regarding performance measures for managerial decision making, in partial fulfillment of the requirements for a Ph.D. in Systems Science: Business Administration. Each selected company is coded for anonymity.

Within the next couple of days you will be receiving the survey from this same email address. We would greatly appreciate it if you could take a few moments to complete it. By doing so you will help ensure that we have the best information possible. If you have any questions, or if a different contact should be used for the email survey distribution, please advise rfowke@pdx.edu using Company Code 1000.001.

Thank you in advance for your cooperation.

Sincerely,

Robert Fowke, Ph.D. Candidate
Portland State University

Date: 09/14/09

To: Beverly Fuller
Dissertation Committee Member
Portland State University

From: Robert Fowke
Portland State University

As mentioned previously your company is one of a set of publicly traded companies that has been selected to participate in a brief 3 - 5 minute, 12 question survey regarding performance measures in partial fulfillment of the requirements for a Ph.D. in Systems Science: Business Administration.

This study accommodates responses from a variety of industries, job functions, and departments. Selected companies are coded for anonymity and participants will remain anonymous. Please use company code 1000.001 when completing this questionnaire to assure company anonymity.

http://survey.oit.pdx.edu/ss/l.dll/JGsB694B5E81WZD9U27673J.htm

Results of the survey will be made available to participants upon request. If you have any questions, or if a different contact should be used for the email survey distribution, please advise rfowke@pdx.edu using Company Code 1000.001.

For questions regarding the validity of this study, please contact the Human Subjects Research Review Committee, Office of Research and Sponsored Projects, 600 Unitus Bldg., Portland State University, (503) 725-4288 / 1-877-480-4400. Refer to HSSRC Proposal # 08755.

Thank you in advance for your consideration and participation.

Sincerely,

Robert Fowke, Ph.D. Candidate
Portland State University

Date: 09/21/09

To: Beverly Fuller
Dissertation Committee Member
Portland State University

From: Robert Fowke
Portland State University

About a week ago we sent you a survey via e-mail. Your company was randomly selected from a set of publicly traded companies for participation.

If you have already completed the questionnaire, please accept our sincere thanks. If not, please do so today using Company Code 1000.001. The questionnaire is a very brief 3 - 5 minute, 12 question questionnaire that will help define synergies in multi-attribute performance measurement systems. If someone else in your company would be the appropriate person to complete the questionnaire, please ask them to do so using the same Company Code 1000.001.

Please find the survey link included in this message for your convenience:

http://survey.oit.pdx.edu/ss/l.dll/JGsB694B5F91WZD9U27674J.htm

For questions regarding the validity of this study, please contact the Human Subjects Research Review Committee, Office of Research and Sponsored Projects, 600 Unitus Bldg., Portland State University, (503) 725-4288 / 1-877-480-4400. Refer to HSRRC Proposal # 08755.

Thank you in advance for your consideration and participation.

Sincerely,

Robert Fowke, Ph.D. Candidate
Portland State University

Date: 10/14/09

To: Beverly Fuller
Dissertation Committee Member
Portland State University

From: Robert Fowke
Portland State University

About four weeks ago I sent you a brief 3 -5 minute, 12 question survey about your company's use of performance measurements. To the best of our knowledge no one from your company has yet participated.

The comments of people who have already responded include a wide variety of measurement systems. We think the results are going to be very useful to define synergies in multi-attribute performance measurement systems.

We are writing again because of the importance that your questionnaire has for helping to get accurate results. Although we sent questionnaires to a random selection of publicly traded companies, it's only by hearing from nearly everyone in the sample that we can be sure that the results are truly representative.

A few people have written to advise that they are not the appropriate company contact. If this is the case, please advise rfowke@pdx.edu of the best contact for your company (Company Code 1000.001).

A comment on our survey procedures: Individual names are not included in the survey response, and so remain anonymous. As noted above, the company is also coded for confidentiality. Protecting the confidentiality of people's answers is very important to us, as well as the University.

We hope you will fill out and return the questionnaire soon. Please find the survey link included in this message for your convenience:

http://survey.oit.pdx.edu/ss/l.dll/JGsB694B5701WZD9U27675J.htm

Sincerely,

Robert Fowke, Ph.D. Candidate
Portland State University

P. S. If you have concerns or problems about your participation in this study or your rights as a research subject, please contact the Human Subjects Research Review Committee, Office of Research and Sponsored Projects, 600 Unitus Bldg., Portland State University, (503) 725-4288 / 1-877-480-4400. Refer to HSRRC Proposal # 08755. If you have questions about the study itself, contact Robert Fowke at Portland State University, c/o Dr. Beverly Fuller, SBA.

Date: 11/09/09

To: Beverly Fuller
Dissertation Committee Member
Portland State University

From: Robert Fowke
Portland State University

During the last two months we have sent you several email requests about a research study we are conducting in partial fulfillment of the requirements for a Ph.D. in Systems Science: Business Administration.

The purpose is to help define synergies in multi-attribute performance measurement systems among publicly traded companies.

The study is drawing to a close and this is the last contact that will be made to the random selection of companies.

We are sending this final contact because of our concern that people who have not responded may utilize different performance measurement systems than those who have responded. Hearing from everyone in this small sample survey helps assure that the survey results are as accurate as possible.

We also want to assure you that your response to this study is voluntary, and if you prefer not to respond that is fine.

Finally, we appreciate your willingness to consider our request as we conclude this effort to better understand performance measurement system synergies in publicly traded companies.

We hope you will take the opportunity fill out and submit the brief 12 question questionnaire using Company Code 1000.001:

http://survey.oit.pdx.edu/ss/l.dll/JGsB694C6C8lWZD9U27676J.htm

For questions regarding the validity of this study, please contact the Human Subjects Research Review Committee, Office of Research and Sponsored Projects, 600 Unitus Bldg., Portland State University, (503) 725-4288 / 1-877-480-4400. Refer to HSRRC Proposal # 08755

Sincerely,

Robert Fowke, Ph.D. Candidate
Portland State University

Appendix L: Survey Results

Resp. ID	Date Submitted	IP Address	Company Code	product change	processes change	performance measurement change
1	2/27/2009 11:11	70.108.251.167	3250.453	Don't know	Don't know	Don't know
2	2/27/2009 11:56	209.63.205.1	3360.048	< 3 years	<3 years	<3 years
3	2/27/2009 12:06	72.236.149.3	4230.135	< 3 years	<3 years	<3 years
4	2/27/2009 12:52	198.69.123.41	7220.054	< 3 years	<3 years	<3 years
5	3/2/2009 8:14	67.85.119.60	4230.135	< 3 years	<3 years	>10 years
6	3/2/2009 14:46	168.215.137.121	5250.475	< 3 years	<3 years	<3 years
7	3/6/2009 8:51	65.206.42.2	7130.039	< 3 years	3 - 10 years	<3 years
8	3/9/2009 11:19	64.74.23.10	8120.006	< 3 years	3 - 10 years	<3 years
9	3/24/2009 6:42	65.175.139.75	5410.052	< 3 years	<3 years	3 - 10 years
10	3/24/2009 11:27	64.129.227.4	5410.352	3 - 10 years	3 - 10 years	3 - 10 years
11	3/26/2009 15:47	198.160.190.11	3250.303	< 3 years	<3 years	<3 years
12	4/1/2009 15:30	156.73.204.228	2210.105	3 - 10 years	3 - 10 years	<3 years
13	4/3/2009 6:48	71.43.152.106	2370.001	< 3 years	<3 years	<3 years
14	4/27/2009 17:25	69.74.70.138	3110.038	< 3 years	<3 years	3 - 10 years
15	4/28/2009 10:56	67.141.188.233	3250.153	< 3 years	Don't know	Don't know
16	4/29/2009 14:26	63.78.48.130	3110.058	Don't know	<3 years	3 - 10 years
17	9/14/2009 11:39	12.52.23.98	3330.104	< 3 years	3 - 10 years	3 - 10 years
18	9/14/2009 11:43	70.89.43.110	3110.084	< 3 years	<3 years	<3 years
19	9/14/2009 11:43	69.74.132.195	5110.159	< 3 years	<3 years	<3 years
20	9/14/2009 11:45	204.111.32.126	5220.625	< 3 years	<3 years	3 - 10 years
21	9/14/2009 11:48	4.21.1.2	5220.315	< 3 years	3 - 10 years	3 - 10 years
22	9/14/2009 11:54	216.185.74.157	5620.03	> 10 years	3 - 10 years	3 - 10 years
23	9/14/2009 11:56	63.252.73.233	5220.349	< 3 years	3 - 10 years	>10 years
24	9/14/2009 12:47	192.122.244.74	2210.101	> 10 years	<3 years	<3 years
25	9/14/2009 12:53	74.95.96.97	3120.033	3 - 10 years	>10 years	<3 years
26	9/14/2009 12:54	208.47.77.6	3340.439	< 3 years	<3 years	3 - 10 years
27	9/14/2009 14:09	12.129.83.52	3220.006	3 - 10 years	3 - 10 years	3 - 10 years
28	9/14/2009 14:34	207.118.55.15	3330.13	< 3 years	<3 years	3 - 10 years
29	9/14/2009 20:04	72.241.200.134	5330.016	> 10 years	3 - 10 years	Don't know
30	9/15/2009 8:03	207.14.236.120	5220.319	< 3 years	<3 years	<3 years
31	9/15/2009 8:22	24.105.177.201	3330.07	< 3 years	<3 years	<3 years
32	9/15/2009 8:56	205.149.142.22	3340.499	3 - 10 years	3 - 10 years	3 - 10 years
33	9/15/2009 9:23	198.51.251.199	3340.601	< 3 years	<3 years	<3 years
34	9/15/2009 9:47	69.55.155.226	2210.049	> 10 years	>10 years	>10 years
35	9/15/2009 13:45	70.150.142.201	5220.359	< 3 years	<3 years	3 - 10 years
36	9/15/2009 13:58	24.199.194.26	5240.074	3 - 10 years	3 - 10 years	3 - 10 years
37	9/15/2009 14:05	216.195.221.162	5250.791	3 - 10 years	<3 years	3 - 10 years
38	9/15/2009 14:51	63.64.84.194	5220.337	< 3 years	<3 years	>10 years
39	9/15/2009 15:41	72.255.60.179	5220.135	< 3 years	<3 years	<3 years
40	9/15/2009 15:58	160.69.1.242	3360.074	< 3 years	<3 years	<3 years
41	9/16/2009 9:03	70.165.34.2	3390.087	< 3 years	3 - 10 years	3 - 10 years
42	9/16/2009 17:49	75.144.127.213	3340.421	3 - 10 years	3 - 10 years	3 - 10 years
43	9/17/2009 8:40	64.47.57.228	5150.099	< 3 years	3 - 10 years	3 - 10 years
44	9/18/2009 13:23	65.203.132.130	3250.277	3 - 10 years	3 - 10 years	<3 years
45	9/21/2009 11:03	66.45.174.194	3220.026	> 10 years	<3 years	3 - 10 years
46	9/21/2009 11:21	97.118.129.64	2370.027	Don't know	3 - 10 years	Don't know
47	9/21/2009 11:59	76.112.253.158	5410.018	< 3 years	<3 years	3 - 10 years
48	9/21/2009 12:00	12.163.232.166	5220.199	< 3 years	<3 years	3 - 10 years

Resp. ID	Date Submitted	IP Address	Company Code	product change	processes change	performance measurement change
49	9/21/2009 13:21	204.60.84.2	5220.679	< 3 years	<3 years	3 - 10 years
50	9/21/2009 15:11	65.117.82.150	3320.007	< 3 years	<3 years	3 - 10 years
51	9/22/2009 2:10	82.111.224.229	2110.06	> 10 years	>10 years	3 - 10 years
52	9/22/2009 6:31	64.198.156.98	3340.191	< 3 years	<3 years	<3 years
53	9/22/2009 6:35	76.5.100.58	5220.233	< 3 years	<3 years	Don't know
54	9/22/2009 10:42	65.123.193.159	5220.449	3 - 10 years	3 - 10 years	3 - 10 years
55	9/22/2009 11:54	173.14.208.177	5110.019	< 3 years	<3 years	<3 years
56	9/22/2009 13:36	198.204.43.202	3330.146	< 3 years	<3 years	3 - 10 years
57	9/23/2009 11:30	209.149.145.162	5220.659	< 3 years	<3 years	<3 years
58	9/24/2009 12:11	72.48.145.130	2210.001	3 - 10 years	<3 years	3 - 10 years
59	9/27/2009 19:50	63.125.144.103	3250.449	3 - 10 years	3 - 10 years	<3 years
60	9/28/2009 8:31	65.51.35.66	5610.078	< 3 years	<3 years	3 - 10 years
61	10/14/2009 9:48	12.48.114.48	5220.499	< 3 years	<3 years	<3 years
62	10/14/2009 10:04	146.126.61.241	2210.141	> 10 years	3 - 10 years	<3 years
63	10/14/2009 10:07	12.105.95.2	3260.036	< 3 years	<3 years	3 - 10 years
64	10/14/2009 11:45	206.201.24.250	5110.005	< 3 years	<3 years	<3 years
65	10/14/2009 12:41	205.169.14.166	4430.006	< 3 years	<3 years	<3 years
66	10/14/2009 13:31	70.182.107.9	3350.009	< 3 years	<3 years	Don't know
67	10/14/2009 15:47	12.90.233.118	3340.131	< 3 years	<3 years	<3 years
68	10/15/2009 12:16	38.98.145.30	5410.15	> 10 years	<3 years	<3 years
69	10/16/2009 9:48	66.238.13.98	3250.035	< 3 years	<3 years	<3 years
70	10/25/2009 6:46	74.10.239.2	9999.999	< 3 years	<3 years	3 - 10 years
71	10/26/2009 17:19	98.207.37.202	3340.477	< 3 years	<3 years	Don't know
72	11/4/2009 9:03	209.0.205.243	3340.229	Don't know	Don't know	Don't know
73	11/9/2009 13:58	70.184.232.149	5220.417	< 3 years	<3 years	<3 years
74	11/11/2009 11:01	207.126.196.16	8120.028	3 - 10 years	<3 years	3 - 10 years
75	11/13/2009 7:52	38.97.193.114	2110.146	> 10 years	<3 years	>10 years
76	11/13/2009 8:17	168.220.96.73	4410.025	3 - 10 years	<3 years	<3 years

Resp. ID	position		department	
1	Executive		Corporate	
2	Executive		Finance	
3	Front line Supervisor		Finance	
4	Executive		Finance	
5	Executive		Corporate	
6	Executive		Finance	
7	Other	Director	Finance	
8	Executive	CEO	Corporate	
9	Executive		Corporate	
10	VP		Corporate	
11	Other	Public Relations	Corporate	
12	Other	Director	Corporate	
13	Executive		Corporate	
14	VP		HR	
15	Executive		Corporate	
16	VP		Corporate	
17	VP		Finance	
18	Executive		Corporate	
19	Executive		Corporate	
20	Executive		Finance	
21	Executive		Corporate	
22	Executive		Corporate	
23	VP		Finance	
24	Other	Investor Relations Officer	Finance	
25	Executive		Finance	
26	Executive		Corporate	
27	Executive		Finance	
28	Executive		Finance	
29	Executive		Finance	
30	Executive	CFO	Finance	
31	Executive		Corporate	
32	Executive		Corporate	
33	Executive		Finance	
34	VP		Finance	
35	VP		Corporate	
36	VP		Finance	
37	Other	Assist. VP	Other	Construction/Operations
38	Executive		Finance	
39	Executive		Finance	
40	Executive		Corporate	
41	Executive		Finance	
42	Executive		Finance	
43	Executive		Finance	
44	Executive		Finance	
45	Executive		Finance	
46	Other	controller	Finance	
47	Executive		Corporate	
48	Executive		Finance	

Resp. ID	position		department	
49	Executive		Finance	
50	Executive			
51	Executive		Finance	
52	Executive		Finance	
53	VP		Finance	
54	VP		Finance	
55	Other	Snr Dir Fin. Head of IR	Finance	
56	Executive		HR	
57	VP		Corporate	
58	Executive		Finance	
59	Executive		Finance	
60	Executive		Corporate	
61	Executive		Finance	
62	VP		Finance	
63	Executive		Corporate	
64	Executive		Corporate	
65	Executive		Corporate	
66	Executive		Finance	
67	Other	QE	Production	
68	Executive		Finance	
69	Executive		Finance	
70	Executive		Corporate	
71	Other	Dir & Investor Relations	Finance	
72	Other	Accountant	Finance	
73	Executive		Other	CFO - oversee fin & operations
74	Executive		Finance	
75	Other	Controller	Finance	
76	Executive		Finance	

Resp. ID	Number of Financial Measures	Number of Internal Operating Measures	Number of Employee Measures	Number of Customer Measures
1	0	0	0	0
2	10	5	5	3
3	4	7	2	5
4	50	20	15	20
5	20	30	5	25
6	10	12	6	10
7	4	20	2	20
8	5	20	5	5
9	20	20	5	10
10	6	8	10	8
11	20	30	15	20
12	20	100	20	50
13	10	3	4	3
14	10	10	5	8
15	14	15	0	3
16	9	8	4	3
17				
18	3	3	2	4
19	10	5	3	8
20	10	2	5	7
21	8	2	3	4
22	7	2	5	4
23	10	10	7	4
24	300	400	50	100
25	6	5	0	3
26	7	10	0	3
27	20	10	4	6
28	10	10		
29	8	5	3	2
30	50	100	25	25
31	10	20	10	10
32	10	15	5	8
33	7	3	2	2
34	5	5	1	1
35	8	5	5	4
36	5	15	2	3
37	9	12	4	7
38	4	5	3	2
39	40	10	10	10
40	13	200	10	20
41	20	25	6	10
42	7	3	0	2
43	10	20	5	10
44	13	8	4	1
45	25	15	15	5
46	2	4	2	2
47	10	4	2	1
48	20	20	5	5

Resp. ID	Number of Financial Measures	Number of Internal Operating Measures	Number of Employee Measures	Number of Customer Measures
49	15	10	3	3
50				
51	5	0	0	0
52	12	24	10	10
53	15	10	2	8
54	6	1	1	4
55	10	5	4	5
56	5	5	7	6
57	35	0	0	10
58	4	30	2	
59	25	50	10	30
60	10	5	5	1
61	12	15	24	12
62	6	7	25	5
63	12	12	6	10
64	5	25	5	10
65	10	6	10	3
66	7	5	4	2
67	4	6	1	4
68	15	10	5	5
69	25	30	4	10
70	7	10	3	2
71	15	20	5	10
72	5	0	0	0
73	20	40	15	15
74	20	20	10	10
75	10	1	2	0
76	20	50	20	10

Resp. ID	Rank 1	Rank 2	Rank 3	Rank 4
1				
2	Identity Processes	Background Processes	Mandated Processes	Priority Processes
3	Priority Processes	Background Processes	Identity Processes	Mandated Processes
4	Identity Processes	Priority Processes	Background Processes	Mandated Processes
5	Mandated Processes	Background Processes	Identity Processes	Priority Processes
6	Priority Processes	Background Processes	Identity Processes	Mandated Processes
7	Identity Processes	Background Processes	Priority Processes	Mandated Processes
8	Priority Processes	Mandated Processes	Background Processes	Identity Processes
9	Identity Processes	Priority Processes	Background Processes	Mandated Processes
10	Priority Processes	Mandated Processes	Background Processes	Identity Processes
11	Background Processes	Mandated Processes	Priority Processes	Identity Processes
12	Identity Processes	Priority Processes	Background Processes	Mandated Processes
13	Background Processes	Priority Processes	Mandated Processes	Identity Processes
14	Background Processes	Mandated Processes	Priority Processes	Identity Processes
15	Background Processes	Priority Processes	Identity Processes	Mandated Processes
16	Background Processes	Mandated Processes	Identity Processes	Priority Processes
17	Mandated Processes	Background Processes	Identity Processes	Priority Processes
18	Background Processes	Mandated Processes	Priority Processes	Identity Processes
19	Identity Processes	Background Processes	Priority Processes	Mandated Processes
20	Mandated Processes	Background Processes	Priority Processes	Identity Processes
21	Mandated Processes	Identity Processes	Priority Processes	Background Processes
22	Mandated Processes	Identity Processes	Priority Processes	Background Processes
23	Identity Processes	Priority Processes	Mandated Processes	Background Processes
24	Mandated Processes	Priority Processes	Identity Processes	Background Processes
25	Priority Processes	Background Processes	Mandated Processes	Identity Processes
26	Background Processes	Priority Processes	Identity Processes	Mandated Processes
27	Background Processes	Priority Processes	Identity Processes	Mandated Processes
28				
29	Background Processes	Identity Processes	Priority Processes	Mandated Processes
30	Identity Processes	Mandated Processes	Priority Processes	Background Processes
31	Priority Processes	Background Processes	Identity Processes	Mandated Processes
32	Background Processes	Mandated Processes	Identity Processes	Priority Processes
33	Identity Processes	Background Processes	Mandated Processes	Priority Processes
34	Priority Processes	Mandated Processes	Background Processes	Identity Processes
35	Priority Processes	Identity Processes	Background Processes	Mandated Processes
36	Priority Processes	Identity Processes	Mandated Processes	Background Processes
37	Background Processes	Mandated Processes	Priority Processes	Identity Processes
38	Mandated Processes	Priority Processes	Identity Processes	Background Processes
39	Identity Processes	Mandated Processes	Priority Processes	Background Processes
40	Priority Processes	Mandated Processes	Background Processes	Identity Processes
41	Priority Processes	Mandated Processes	Background Processes	Identity Processes
42	Priority Processes	Mandated Processes	Background Processes	Identity Processes
43	Priority Processes	Identity Processes	Background Processes	Mandated Processes
44	Mandated Processes	Priority Processes	Identity Processes	Background Processes
45	Background Processes	Identity Processes	Mandated Processes	Priority Processes
46	Background Processes	Mandated Processes	Priority Processes	Identity Processes
47	Priority Processes	Mandated Processes	Background Processes	Identity Processes
48	Background Processes	Mandated Processes	Priority Processes	Identity Processes

Resp. ID	Rank 1	Rank 2	Rank 3	Rank 4
49	Mandated Processes	Background Processes	Priority Processes	Identity Processes
50	Background Processes	Mandated Processes	Priority Processes	Identity Processes
51	Background Processes	Identity Processes	Priority Processes	Mandated Processes
52	Background Processes	Identity Processes	Priority Processes	Mandated Processes
53	Mandated Processes	Background Processes	Priority Processes	Identity Processes
54	Mandated Processes	Identity Processes	Priority Processes	Background Processes
55	Identity Processes	Priority Processes	Background Processes	Mandated Processes
56	Priority Processes	Identity Processes	Mandated Processes	Background Processes
57	Mandated Processes	Priority Processes	Identity Processes	Background Processes
58	Priority Processes	Background Processes	Identity Processes	Mandated Processes
59	Mandated Processes	Identity Processes	Background Processes	Priority Processes
60	Background Processes	Mandated Processes	Priority Processes	Identity Processes
61	Mandated Processes	Background Processes	Priority Processes	Identity Processes
62	Mandated Processes	Background Processes	Identity Processes	Priority Processes
63	Background Processes	Priority Processes	Identity Processes	Mandated Processes
64	Background Processes	Mandated Processes	Identity Processes	Priority Processes
65	Background Processes	Mandated Processes	Priority Processes	Identity Processes
66	Identity Processes	Background Processes	Priority Processes	Mandated Processes
67	Priority Processes	Identity Processes	Mandated Processes	Background Processes
68	Mandated Processes	Priority Processes	Background Processes	Identity Processes
69	Priority Processes	Mandated Processes	Background Processes	
70	Background Processes	Mandated Processes	Identity Processes	Priority Processes
71	Background Processes	Identity Processes	Priority Processes	Mandated Processes
72				
73	Background Processes	Mandated Processes	Priority Processes	Identity Processes
74	Background Processes	Mandated Processes	Priority Processes	Identity Processes
75	Background Processes	Mandated Processes		
76	Identity Processes	Priority Processes	Mandated Processes	Background Processes

Resp. ID	Comments or suggestions?
1	We are a very small biotechnology R&D company that outsources most of our operational tasks. Most of your performance questions do not pertain to our current business model.
12	The # of estimated measures relates to the entire corporation. Of just the "Key" metrics, there are about 150-200 in total across Fin'l, Cust, Oper & Employee dimensions with many other "tracking metrics" to keep tabs on more detailed breakdowns of performance. (On Q8, I tried entering 150 but was limited to 100 by the survey [manually adjusted according to comment]). If you have further questions call [*deleted for anonymity*]. Thanks.
15	With all the junk mail going around it took me a while to verify that this request was valid. I found some phone numbers after I clicked on the link but clicking on links from unknown sources in emails is not considered safe.
21	The responses are for our sole operating bank subsidiary. As a non-manufacturing financial institution, most performance measurements are financial in nature and standard for our industry.
24	A good survey. Short and to the point.
30	Going forward you may want to consider using compliance with Sarbanes-Oxley (SOX), as many public companies now use their SOX testing program as a center piece for monitoring performance.
46	Confusing questions.
56	Didn't really understand Question 11 definitions.
73	Seems difficult to rank the processes individually as hopefully the company's identity is based on the premise of providing quality service daily, which is designed to meet regulatory requirements. Therefore, they all work together and by focusing on one of the processes, we are also addressing the other processes at the same time.

Appendix M: NAICS Response Categories Data and Dependent Variable Definition

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	211	060	6.8	-66.05		L					
	211	080	13.3	-64.15							
	211	134	8.5	-55.52							
	211	142	14.1	-46.47							
	211	160	16.8	-27.46							
	211	076	7.6	-21.95							
P	211	098	13.3	-18.97							
	211	162	8.5	-7.82							
P	211	048	15.2	22.58							
	211	114	11.9	37.44	10						
	211	010	11.9	38.72							
	211	126	11.3	39.12							
	211	166	20.9	62.58							
	211	004	11.9	66.13							
	211	154	17.4	73.52							
	211	146	16.0	100.01		M					
P	211	168	11.9	106.04							
	211	022	21.4	110.51							
P	211	128	6.0	111.10							
P	211	008	27.0	134.68	10						
	211	136	16.8	139.27							
P	211	038	18.8	149.23							
P	211	118	14.8	160.45							
	211	112	26.9	166.54							
	211	034	15.8	166.75							
P	211	028	18.8	225.60							
	211	064	19.2	241.53							
	211	082	21.0	249.68							
	211	090	6.9	530.01							
	211	040	9.2	837.52	10		30	115.35	183.42	837.52	-66.05
	221	047	5.2	-74.24							
	221	001	8.3	-72.93		L					
	221	163	18.8	-60.47							
P	221	005	21.0	-25.72							
	221	099	24.2	-15.29							
	221	119	24.4	-1.95							
	221	033	16.8	6.97							
	221	071	5.2	13.17							
	221	073	21.1	13.80							
	221	049	21.1	15.34		L					
P	221	135	21.0	18.20							
	221	091	5.2	19.42							
	221	079	20.9	20.20							
	221	019	24.3	22.86							
	221	087	18.8	23.50							
	221	013	21.0	23.66	16						
P	221	045	15.1	26.49							
P	221	015	21.1	27.82							
	221	153	23.3	28.92							
	221	113	10.5	29.17							
P	221	155	21.1	30.21							
P	221	085	16.8	32.09							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	221	167	23.3	34.37							
	221	041	21.4	37.22							
P	221	105	8.8	37.75		M					
	221	141	27.0	39.33		M					
	221	031	24.0	40.83							
	221	133	14.8	43.02							
	221	117	28.9	43.64							
	221	097	21.0	46.29							
	221	131	7.6	49.95							
	221	029	21.1	50.59	16						
	221	043	25.7	50.74							
P	221	165	24.2	51.03							
P	221	035	24.3	56.99							
	221	011	18.8	61.04							
	221	151	20.9	62.14							
	221	101	18.8	69.92		H					
	221	139	21.0	79.86							
	221	137	16.8	81.24							
	221	017	8.1	88.83							
	221	067	11.1	90.76							
P	221	095	21.3	91.49							
	221	069	25.5	92.50							
	221	123	23.7	97.05							
	221	051	24.4	120.93							
P	221	055	18.8	135.11							
	221	103	5.0	149.99	16		48	39.66	45.72	149.99	-74.24
	237	009	18.3	-56.18							
	237	027	11.9	-40.21		L					
	237	029	16.8	-26.06	3						
	237	013	16.8	-15.46							
	237	015	19.7	-8.40							
P	237	001	10.2	5.56	3	M					
	237	019	18.8	41.02							
P	237	031	15.8	66.20							
	237	003	24.3	86.16	3		9	5.85	48.70	86.16	-56.18
P	311	058	18.8	-61.97		L					
	311	002	11.2	-54.20							
	311	076	22.6	-38.81							
	311	062	6.9	-29.75							
P	311	088	22.4	-23.78							
	311	084	13.3	-22.94		L					
	311	040	23.4	-16.74							
	311	064	5.2	-14.70	8						
	311	050	18.8	-8.04							
	311	074	19.0	-2.07							
	311	020	18.8	2.98							
	311	070	21.3	3.03							
	311	022	6.9	5.03							
P	311	078	10.5	6.70							
	311	056	18.8	10.88							
	311	080	8.3	11.94	8						
	311	072	15.1	24.12							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
P	311	038	14.9	25.87		H					
	311	046	8.8	37.74							
	311	034	25.5	45.90							
	311	044	18.8	46.59							
	311	052	13.3	73.47							
	311	030	21.1	138.83							
	311	066	6.1	323.73							
	311	036	15.3	398.10	9		25	35.28	107.04	398.10	-61.97
	312	033	8.8	-45.67		L					
P	312	021	9.5	-37.18							
	312	013	16.8	-7.08	3						
	312	025	9.8	2.71							
P	312	011	46.9	27.00							
	312	023	24.1	51.45	3						
	312	035	21.2	77.29							
P	312	031	19.5	77.44							
P	312	001	38.9	90.04							
	312	039	14.3	101.96	4		10	33.80	53.70	101.96	-45.67
	322	018	5.2	-63.33							
	322	034	18.8	-34.60							
P	322	032	14.9	-34.13							
	322	028	13.0	-30.79	4						
	322	016	23.4	-19.99							
	322	004	24.3	4.33							
	322	010	16.8	9.03	3						
	322	030	18.8	25.82							
	322	026	23.1	56.80		H					
	322	008	13.3	152.01							
P	322	012	12.8	180.24							
	322	006	16.2	Chapter 11	4		11	22.31	78.63	180.24	-63.33
P	325	113	11.8	-98.73							
	325	539	8.5	-98.10							
	325	541	13.3	-97.42							
	325	361	8.7	-96.90							
	325	407	18.8	-96.65							
	325	511	14.6	-96.16							
	325	419	10.5	-95.69							
	325	365	8.5	-95.27							
P	325	513	8.3	-94.46							
	325	291	8.4	-93.55							
	325	069	15.3	-91.63							
	325	001	21.3	-89.15							
	325	427	13.2	-88.51							
	325	017	12.5	-86.91							
	325	245	11.3	-86.66							
	325	181	16.8	-86.26							
P	325	053	8.8	-81.76							
P	325	273	12.2	-81.34							
P	325	423	10.3	-80.64							
	325	241	12.4	-78.93							
	325	435	18.8	-76.88							
	325	399	17.1	-76.48							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	325	147	6.0	-75.06							
	325	271	8.5	-74.29							
	325	385	14.6	-74.07							
	325	519	18.8	-73.32							
	325	359	14.6	-72.84							
	325	501	12.8	-71.07							
P	325	013	8.1	-70.48							
	325	151	13.3	-70.29							
	325	351	18.8	-69.81							
P	325	153	8.5	-69.66		L					
P	325	223	8.1	-65.10							
	325	267	8.4	-64.88							
	325	521	11.2	-62.17							
	325	559	6.8	-61.76							
P	325	373	8.5	-61.63							
	325	319	9.8	-60.56							
	325	115	18.8	-58.96							
	325	247	15.0	-57.12							
	325	035	20.5	-56.57		L					
	325	397	9.3	-55.96							
	325	389	21.6	-54.43	43						
	325	221	8.0	-53.68							
	325	041	11.0	-53.57							
P	325	333	16.8	-53.20							
	325	185	46.9	-51.51							
	325	091	8.5	-47.95							
	325	037	24.3	-47.38							
	325	171	11.0	-47.10							
P	325	453	5.2	-46.45		M					
	325	167	19.8	-45.39							
P	325	243	11.4	-43.22							
P	325	383	13.0	-42.87							
P	325	163	16.8	-41.72							
P	325	323	15.1	-40.10							
P	325	263	18.8	-39.07							
P	325	493	16.8	-38.83							
	325	421	14.8	-38.38							
	325	111	17.2	-35.68							
	325	331	8.3	-33.51							
	325	217	9.6	-31.41							
	325	059	12.2	-30.47							
	325	445	11.1	-26.31							
P	325	093	16.8	-25.62							
	325	497	15.2	-24.32							
	325	177	31.9	-21.13							
	325	355	15.2	-20.13							
	325	529	23.8	-19.42							
	325	161	12.3	-18.90							
	325	297	16.8	-18.01							
	325	495	16.3	-15.57							
	325	461	8.0	-14.78							
	325	547	15.8	-14.11							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	325	255	18.7	-12.42							
	325	401	12.6	-11.31							
	325	531	16.8	-8.19							
	325	065	15.1	-6.94							
	325	057	8.4	-5.06							
	325	301	13.1	-3.25							
	325	179	46.9	0.21							
	325	277	8.5	3.56		M					
	325	479	16.9	3.93							
	325	099	31.9	5.64							
	325	195	8.4	8.20							
	325	437	8.2	8.38							
	325	475	22.4	9.62	44						
	325	455	8.5	12.46							
	325	417	8.4	13.43							
	325	045	20.5	13.57							
	325	025	6.3	14.33							
P	325	303	9.8	15.55		H					
	325	299	12.8	16.86							
	325	031	19.5	25.86							
	325	055	9.8	26.92							
	325	465	18.8	27.73							
	325	395	21.0	30.00							
	325	329	8.8	30.02							
P	325	003	16.9	31.37							
	325	117	17.7	36.34							
	325	119	11.9	37.01							
	325	105	14.6	39.09							
	325	481	20.9	44.05							
	325	145	31.9	47.53							
	325	315	21.1	50.43							
	325	009	16.8	56.11							
	325	211	18.8	60.12							
P	325	023	25.7	60.52							
P	325	253	17.5	68.27							
	325	425	17.0	90.79							
	325	485	11.3	92.43							
	325	141	18.8	94.63							
	325	457	18.8	96.57							
	325	439	16.5	108.49							
P	325	293	11.5	112.57							
	325	261	23.0	152.71							
	325	209	23.4	169.01							
P	325	033	8.5	175.03							
	325	039	22.5	181.19							
	325	525	9.5	181.58							
	325	449	16.8	181.67		H					
	325	075	22.5	186.47							
	325	227	16.9	207.28							
P	325	043	5.4	301.99							
	325	087	9.4	363.53							
	325	337	16.8	429.00							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
P	325	473	18.9	503.64							
	325	447	12.1	582.35							
	325	335	11.9	680.70							
	325	107	5.2	727.67							
	325	515	16.8	1007.75	44		131	22.51	166.53	1007.75	-98.73
	326	018	13.2	-80.12							
P	326	002	24.3	-57.63							
	326	010	21.1	-49.44	3						
	326	034	11.9	-37.05							
	326	026	8.3	-22.27							
P	326	022	16.8	-4.07							
	326	008	21.1	-1.80	4						
P	326	032	8.0	13.71							
	326	004	15.7	80.18							
	326	036	15.0	152.48	3	H	10	-0.60	69.87	152.48	-80.12
P	332	015	8.5	-67.46							
	332	059	7.5	-65.99							
	332	013	10.8	-49.52							
	332	049	15.5	-20.51							
	332	037	16.7	-16.15							
	332	007	9.3	-15.18		L					
	332	051	14.6	-10.80	7						
	332	017	18.8	-3.77							
P	332	065	18.8	3.53							
P	332	005	24.3	20.93							
P	332	055	21.0	25.38							
	332	001	24.3	29.91							
	332	019	16.8	33.42							
P	332	025	21.1	38.92	7						
	332	041	23.4	51.02							
	332	023	11.7	54.31							
	332	053	23.4	67.48							
	332	061	11.9	102.67							
	332	029	10.8	144.86							
	332	047	21.9	194.39							
P	332	035	8.5	363.53							
	332	039	16.8	400.51	8		22	58.25	122.35	400.51	-67.46
P	333	098	11.7	-79.28							
	333	062	18.8	-59.48							
	333	122	17.6	-54.88							
P	333	038	22.3	-43.36							
	333	130	13.8	-29.69		L					
	333	020	21.9	-27.86							
	333	166	31.9	-19.38							
P	333	168	16.8	-13.55							
	333	104	23.4	-12.99		L					
P	333	148	5.2	-5.90							
	333	006	15.8	-1.10							
	333	030	8.5	1.99							
P	333	118	16.3	4.16							
P	333	078	21.1	5.40							
	333	066	21.8	12.20							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	333	150	21.0	12.76							
	333	002	8.3	29.43	17						
	333	080	13.0	42.08							
	333	114	17.3	44.02							
	333	076	19.5	44.08							
P	333	108	18.8	44.69							
	333	050	21.5	46.27							
	333	146	16.8	55.55		M					
	333	056	21.1	57.84							
	333	102	16.8	59.93							
	333	032	46.9	64.38							
	333	156	9.8	78.23							
	333	010	24.3	84.90							
	333	012	22.5	94.86							
P	333	058	18.8	95.48							
P	333	048	26.9	97.03							
	333	136	25.7	106.80							
	333	086	13.3	115.57							
	333	092	13.5	116.35	17						
	333	100	16.8	129.28							
P	333	138	23.4	132.32							
	333	110	7.8	145.07							
	333	064	14.7	152.74							
	333	046	8.8	156.66							
	333	072	11.6	161.59							
P	333	068	16.8	173.55							
	333	042	12.8	181.38							
	333	096	18.8	190.81							
	333	044	24.0	196.99							
	333	060	7.5	247.33							
	333	082	7.5	287.38							
	333	094	16.8	304.05							
	333	024	12.3	416.08							
	333	142	16.9	552.03							
P	333	088	5.2	716.37							
	333	070	16.8	978.17	17	H	51	119.38	192.16	978.17	-79.28
	334	029	14.5	-99.62							
P	334	115	9.3	-98.51							
	334	143	7.6	-98.51							
	334	197	8.8	-95.05							
P	334	635	13.3	-94.60							
P	334	445	11.8	-94.54							
	334	671	9.7	-94.31							
	334	311	15.8	-92.95							
	334	083	11.7	-91.54							
	334	291	15.7	-91.14							
	334	213	8.8	-90.73							
	334	177	9.5	-90.53							
P	334	025	8.4	-89.50							
P	334	035	10.8	-89.04							
	334	141	9.9	-88.76							
	334	049	8.3	-88.63							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
P	334	275	8.5	-86.50							
	334	171	12.6	-86.34							
	334	663	13.0	-84.50							
	334	677	5.1	-84.17							
	334	447	8.4	-83.53							
	334	289	16.8	-83.34							
P	334	425	9.1	-83.07							
	334	587	14.6	-81.54							
	334	503	14.3	-81.53							
	334	039	11.6	-81.36							
	334	051	16.8	-80.94							
P	334	465	15.0	-80.50							
	334	357	18.8	-80.05							
	334	147	13.3	-78.3							
P	334	215	15.8	-78.01							
	334	551	8.5	-77.70							
	334	037	17.5	-76.99							
	334	493	8.5	-76.41							
	334	179	11.3	-75.69							
	334	059	16.8	-75.50							
	334	509	8.5	-75.06							
	334	139	18.8	-74.71							
P	334	135	12.6	-74.53							
	334	543	9.9	-74.38							
	334	201	14.0	-72.36							
	334	597	14.9	-71.15							
	334	661	16.8	-70.85							
	334	463	18.8	-69.83							
	334	359	7.1	-68.39							
P	334	385	12.3	-68.39							
	334	541	13.1	-67.12							
	334	111	8.8	-66.40							
	334	321	15.1	-66.32							
	334	127	18.8	-65.93							
	334	087	13.0	-65.75							
P	334	185	14.7	-65.53							
	334	637	5.2	-64.97							
	334	347	13.1	-64.70							
	334	033	9.2	-64.45							
	334	479	12.0	-64.45							
	334	573	11.7	-64.27							
	334	309	12.8	-63.82							
	334	529	8.7	-63.68							
	334	133	18.8	-62.97							
	334	403	15.8	-62.73							
	334	339	18.8	-62.14							
P	334	015	5.2	-61.46							
	334	161	16.8	-61.41							
P	334	255	13.7	-61.22							
P	334	615	13.5	-61.08							
	334	613	8.4	-60.77							
	334	667	13.6	-60.13							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	334	527	7.0	-59.75							
	334	513	9.1	-58.54							
	334	459	24.3	-58.52							
	334	363	18.8	-57.77							
	334	019	24.3	-56.71							
	334	489	9.3	-56.55							
	334	651	20.9	-55.94							
	334	617	16.0	-55.39	76						
	334	001	19.6	-55.10							
	334	299	21.1	-54.98							
	334	209	14.0	-54.77							
	334	221	9.7	-53.91							
	334	181	14.1	-53.36							
	334	093	13.8	-53.05							
	334	601	21.8	-51.82		M					
	334	337	18.8	-50.84							
	334	467	14.9	-50.02							
	334	471	17.7	-49.11							
	334	267	9.5	-48.96							
	334	523	11.2	-48.57							
P	334	515	13.2	-46.76							
	334	487	8.5	-46.75							
P	334	055	15.8	-46.31							
P	334	475	9.3	-43.80							
	334	399	7.4	-43.59							
P	334	595	18.8	-43.43							
	334	021	15.3	-43.09							
	334	549	8.4	-42.03							
	334	011	24.3	-41.58							
P	334	645	18.8	-38.83							
P	334	435	8.4	-38.25							
P	334	365	15.7	-37.64							
	334	449	13.3	-37.47							
P	334	315	14.9	-35.76							
	334	673	13.3	-35.69							
	334	499	24.3	-34.99		M					
	334	351	18.8	-34.19							
	334	681	13.0	-33.23							
	334	017	17.8	-32.87							
P	334	045	24.4	-32.05							
	334	333	12.7	-31.03							
	334	129	19.2	-30.71							
	334	269	16.8	-30.64							
	334	439	14.4	-30.14		M					
	334	257	16.8	-29.85							
P	334	665	24.3	-28.60							
	334	437	8.2	-28.51							
	334	081	18.5	-27.35							
	334	203	18.8	-27.23							
P	334	675	18.5	-27.11							
	334	031	16.8	-26.59							
	334	007	15.3	-26.37							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	334	397	18.8	-26.08							
	334	539	8.8	-25.65							
	334	353	15.8	-25.52							
	334	631	8.2	-25.12							
	334	377	14.0	-25.04							
P	334	195	8.8	-24.50							
	334	069	17.8	-24.17							
	334	669	5.2	-23.02							
	334	149	21.1	-21.65							
	334	501	11.6	-20.59							
	334	119	11.8	-19.91							
	334	349	18.8	-18.83							
	334	441	18.8	-18.72							
	334	331	16.8	-18.43							
	334	047	24.3	-16.91							
P	334	235	5.4	-16.80							
	334	207	13.5	-16.61							
P	334	075	13.3	-16.54							
	334	293	22.4	-16.48							
P	334	495	15.8	-13.90							
	334	173	10.6	-11.63							
	334	121	18.8	-10.57							
	334	623	8.3	-10.21							
	334	091	10.7	-9.81							
	334	053	24.3	-9.38							
P	334	485	14.8	-6.71							
	334	253	13.6	-6.46							
	334	411	26.9	-6.14							
	334	367	27.0	-5.66							
P	334	225	11.3	-5.16							
	334	041	10.6	-3.47	75						
P	334	565	16.8	-2.57							
	334	113	5.9	-1.83							
	334	409	18.8	-1.82							
	334	621	15.0	-1.65							
	334	061	12.8	-1.60							
	334	603	27.0	-0.67							
	334	433	7.3	1.38							
	334	593	9.5	3.45							
	334	131	18.8	4.49		H					
	334	643	16.8	4.57							
	334	569	19.0	7.45							
	334	319	10.3	7.63							
	334	079	20.1	8.27							
	334	521	13.9	8.33							
	334	301	8.8	9.00							
P	334	505	13.3	9.04							
	334	067	24.3	10.41							
	334	379	15.8	11.39							
	334	123	11.4	12.39							
	334	477	11.0	12.64		H					
P	334	415	5.3	13.01							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	334	427	11.3	13.58							
	334	401	15.3	14.40							
	334	547	21.0	15.86							
	334	281	9.1	16.73							
	334	023	9.1	16.80							
	334	457	11.2	18.25							
	334	629	12.7	18.49							
P	334	575	14.2	19.27							
	334	287	13.3	22.37							
	334	633	20.9	23.06							
	334	589	18.8	23.43							
	334	659	13.1	23.61							
	334	193	18.7	23.76							
	334	451	15.0	24.23							
	334	297	46.9	27.09							
	334	387	20.2	27.19							
	334	607	23.4	29.10							
	334	581	8.5	31.85							
P	334	405	18.8	36.58							
	334	223	9.5	47.96							
	334	557	14.0	48.59							
P	334	005	12.1	51.46							
P	334	335	16.8	51.92							
	334	383	18.8	54.62							
	334	511	10.9	55.13							
P	334	145	27.0	58.06							
	334	077	10.6	60.16							
	334	679	16.4	62.75							
	334	469	18.8	68.59							
	334	199	11.8	70.86							
	334	413	12.0	72.48							
	334	497	27.0	75.83							
P	334	605	21.3	75.92							
P	334	175	16.8	80.46							
	334	443	16.8	89.57							
	334	217	16.8	93.30							
	334	619	16.8	96.37							
P	334	535	18.8	105.08							
	334	157	19.7	106.41							
	334	373	13.3	113.06							
	334	429	9.9	119.29							
	334	043	17.1	126.57							
	334	109	15.8	128.93							
	334	233	15.5	153.13							
	334	191	15.0	154.59		H					
	334	263	19.3	155.88							
	334	343	18.8	159.24							
	334	461	8.8	167.51							
	334	137	16.8	168.26							
P	334	095	9.3	239.81							
	334	261	18.8	259.97							
	334	421	8.5	273.47		H					

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
P	334	555	8.5	290.77							
P	334	325	18.8	403.86							
	334	277	8.4	923.58							
	334	229	9.8	NA for data	76		227	-9.42	97.16	923.58	-99.62
	335	043	8.9	-95.97							
	335	047	10.2	-82.87							
	335	053	12.6	-77.70							
P	335	055	9.1	-68.96							
	335	013	16.8	-68.73							
	335	019	10.6	-68.25							
	335	077	16.8	-66.45							
	335	007	13.3	-58.74	8						
	335	033	11.8	-45.19							
	335	071	16.0	-37.88							
	335	069	8.4	-28.67							
P	335	035	46.9	-13.31							
	335	051	12.7	-6.69							
P	335	045	18.8	-6.35							
	335	067	16.8	-6.02							
	335	009	24.3	21.11	8	M					
P	335	025	15.8	30.33							
	335	001	9.0	59.71							
	335	059	16.8	76.44							
	335	057	8.5	84.06							
	335	079	14.3	100.76							
	335	061	12.3	106.42							
P	335	075	12.6	209.71							
	335	027	15.8	227.97	8	H	24	7.70	89.09	227.97	-95.97
	336	006	18.8	-92.69							
P	336	068	15.3	-83.12							
P	336	078	6.4	-78.12							
	336	110	6.4	-71.83							
	336	104	17.1	-71.15							
	336	044	46.9	-67.55							
	336	094	9.9	-65.90							
P	336	038	31.9	-64.73							
P	336	108	24.1	-63.87							
	336	066	18.8	-55.06							
	336	042	21.7	-49.59	11						
P	336	088	18.9	-40.67							
	336	022	14.8	-39.62							
	336	086	11.2	-29.61							
P	336	048	14.4	-18.86		M					
	336	016	11.7	-3.49							
	336	090	26.9	0.58							
	336	032	16.8	11.20							
P	336	028	24.1	11.69							
	336	070	38.9	23.89							
	336	072	27.0	28.97							
	336	054	38.9	40.91							
P	336	098	12.2	46.96	12						
	336	074	22.4	58.29		H					

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	336	024	18.8	60.79							
	336	020	15.3	61.89							
	336	010	15.5	93.80							
	336	060	31.9	97.79							
	336	052	16.8	123.58							
	336	082	16.8	127.52							
	336	062	13.5	131.22							
	336	050	10.6	159.12							
	336	034	13.3	187.68							
	336	014	24.3	224.77	11		34	17.49	85.85	224.77	-92.69
	339	089	9.5	-92.94							
	339	147	13.3	-91.05							
	339	047	11.1	-85.97							
	339	051	10.5	-81.74							
	339	031	16.1	-79.41							
	339	161	13.3	-79.30							
P	339	123	9.1	-78.11							
P	339	043	11.5	-77.76							
	339	067	16.8	-70.75							
	339	085	10.3	-70.00							
	339	135	11.9	-67.87							
	339	165	14.7	-65.24							
	339	105	6.4	-62.46							
	339	177	16.5	-60.59							
	339	035	14.6	-54.81							
P	339	023	18.5	-45.58							
	339	017	12.2	-41.18							
	339	011	8.8	-38.18							
	339	139	8.3	-35.89	19						
	339	137	16.8	-35.67							
P	339	073	14.8	-35.53							
	339	041	15.8	-33.91							
	339	127	18.8	-32.65							
	339	009	7.9	-32.05							
	339	157	8.3	-27.64							
	339	057	16.8	-22.71							
	339	181	8.4	-22.62							
	339	189	7.3	-22.48							
	339	167	12.3	-20.54							
P	339	053	16.8	-18.91							
P	339	013	8.3	-18.19							
	339	001	38.9	-7.58							
	339	087	16.8	-0.23		M					
	339	111	19.7	3.70							
P	339	163	10.7	5.04							
	339	115	16.8	6.80							
	339	109	26.9	10.22							
	339	069	12.6	18.52	19						
	339	097	12.6	21.74							
	339	175	20.8	25.75							
	339	065	6.5	33.55							
	339	169	16.5	33.81							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	339	101	16.8	41.27							
P	339	133	18.8	50.22							
P	339	103	16.8	57.39							
P	339	183	25.7	60.80							
P	339	153	13.5	62.32							
	339	027	25.7	63.47							
	339	025	25.7	64.75							
	339	055	8.1	64.86							
	339	049	12.8	75.30							
	339	079	27.0	82.86							
	339	077	17.6	83.15							
	339	045	9.0	90.02							
P	339	033	5.6	97.81							
	339	037	9.8	160.64							
P	339	093	8.5	836.15	19		57	7.73	126.14	836.15	-92.94
	423	087	15.0	-90.07							
	423	069	16.8	-78.96							
	423	053	13.5	-71.92							
	423	083	13.1	-70.67							
P	423	125	8.5	-67.83							
	423	043	18.8	-50.11							
	423	121	13.7	-48.65							
	423	091	13.3	-46.26							
P	423	105	11.5	-43.43							
	423	049	8.8	-42.97							
P	423	055	17.3	-35.70	11						
	423	099	13.2	-26.17							
P	423	095	16.2	-25.26							
	423	139	5.2	-23.70							
	423	097	26.9	-20.04							
	423	073	16.8	-14.93							
	423	109	14.8	-9.51							
	423	067	12.1	-5.90							
P	423	135	13.4	-3.13		M					
	423	051	25.7	16.48							
	423	123	14.3	33.66	10						
	423	039	6.3	33.71							
	423	137	12.1	34.94							
	423	057	21.1	38.74							
	423	023	5.2	42.90							
	423	101	14.6	55.34							
P	423	015	24.4	57.57							
	423	133	16.8	57.64							
	423	017	24.3	80.96							
	423	111	15.1	104.74							
	423	007	22.0	112.31							
	423	107	14.3	161.43	11		32	1.73	61.35	161.43	-90.07
P	441	017	12.0	-74.76							
	441	025	21.0	-61.46	2	L					
	441	003	6.8	-24.81							
	441	023	15.7	28.02							
	441	001	7.0	35.89	3						

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
P	441	027	5.2	41.82							
	441	005	17.7	48.72	2		7	-0.94	51.92	48.72	-74.76
	443	008	26.9	-50.55	1						
	443	006	11.4	-6.95	1	M					
	443	004	6.8	316.02	1		3	86.17	200.24	316.02	-50.55
	511	055	12.5	-91.80							
	511	119	19.5	-91.52							
	511	105	21.1	-89.18							
	511	211	9.9	-87.14							
	511	111	9.8	-84.71							
	511	035	12.5	-78.01							
	511	157	13.1	-76.30							
	511	081	23.4	-75.48							
	511	177	8.8	-72.48							
	511	049	16.8	-71.23							
	511	135	8.4	-65.90							
	511	117	9.2	-61.14							
P	511	093	11.6	-56.86							
	511	021	13.4	-48.69							
	511	071	9.6	-44.97							
P	511	123	23.4	-44.30							
	511	037	18.8	-44.01							
P	511	013	11.4	-40.02	18						
	511	091	9.2	-39.14							
	511	011	24.3	-37.59							
	511	167	10.5	-35.59							
	511	147	9.1	-34.17							
	511	067	18.8	-28.43							
	511	139	20.3	-28.24							
	511	151	10.6	-25.27							
	511	159	8.2	-23.97		M					
P	511	143	9.5	-22.07							
	511	175	16.8	-21.27							
	511	001	18.1	-18.20							
	511	115	10.7	-17.03							
	511	019	9.5	-14.22		M					
	511	009	5.2	-10.38							
	511	145	8.3	-10.05							
	511	005	13.8	-9.13		M					
	511	031	9.8	-6.26							
	511	191	16.8	-5.32	18						
	511	165	9.3	1.17							
	511	199	16.8	1.99							
	511	125	22.8	5.29							
	511	065	10.4	16.16							
	511	007	10.4	23.93							
P	511	023	23.4	25.73							
	511	101	15.8	26.69							
	511	195	8.3	27.02							
	511	047	16.0	30.98							
	511	149	12.3	31.19							
P	511	223	18.8	33.88							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	511	041	13.0	36.33							
	511	189	17.3	65.31							
P	511	113	13.5	69.80							
P	511	213	12.1	78.47							
	511	051	12.6	92.96							
	511	207	10.5	106.38							
	511	097	9.3	115.21	18		54	-15.21	51.83	115.21	-91.80
	515	029	9.6	-94.89							
	515	037	9.2	-92.02							
P	515	013	9.9	-82.21							
	515	011	6.7	-77.60	4						
	515	031	15.2	-74.16							
P	515	023	6.6	-72.47							
	515	009	8.5	-51.58	3	M					
	515	027	13.3	-49.98							
	515	015	12.6	-34.33							
	515	035	13.5	-22.13							
	515	025	15.8	41.03	4		11	-55.49	39.56	41.03	-94.89
P	522	531	8.5	-89.00							
	522	689	8.9	-87.38							
	522	029	13.6	-84.30							
	522	303	12.0	-83.62							
	522	163	23.6	-81.40							
	522	327	7.3	-80.64							
	522	335	20.0	-80.49							
	522	247	31.9	-80.06							
P	522	081	8.5	-79.70							
	522	225	12.3	-77.64							
	522	015	7.0	-74.06							
	522	297	18.8	-70.53							
P	522	261	18.8	-67.93							
P	522	131	13.4	-67.66							
	522	363	5.9	-67.27							
	522	019	22.5	-67.12							
	522	089	14.8	-65.29							
	522	439	8.9	-64.68							
	522	667	8.9	-63.55							
	522	589	20.9	-63.43							
	522	493	6.0	-61.53							
	522	617	6.7	-60.53							
	522	723	18.8	-59.07							
	522	389	18.8	-58.45							
	522	153	31.9	-58.33							
	522	673	10.4	-57.54							
	522	635	5.8	-57.42							
P	522	041	13.1	-56.49							
P	522	561	18.8	-55.73							
	522	203	15.8	-55.68							
	522	329	12.1	-55.06							
P	522	711	9.6	-52.88							
P	522	101	9.9	-52.63							
P	522	461	9.0	-52.33							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
P	522	421	5.2	-52.09							
	522	583	6.5	-50.88							
	522	719	10.7	-50.17							
	522	067	13.1	-49.45							
	522	693	5.8	-49.40							
	522	517	12.1	-49.20							
	522	277	8.9	-48.56							
	522	599	6.9	-47.56							
	522	139	18.8	-47.31							
	522	515	9.1	-45.52							
	522	627	12.3	-45.05							
	522	109	11.0	-44.48							
	522	179	10.7	-44.40							
	522	625	8.9	-44.31		L					
	522	513	8.9	-44.26							
	522	125	14.9	-43.96							
P	522	521	12.6	-43.68							
	522	449	7.9	-43.23		L					
	522	113	14.1	-42.47							
	522	385	18.8	-41.69							
P	522	681	11.9	-41.30							
	522	143	18.8	-41.26							
	522	183	18.8	-40.63							
	522	315	6.2	-40.52		L					
	522	093	12.9	-40.45							
	522	055	9.1	-39.65							
	522	287	15.4	-38.43							
	522	477	14.3	-38.43							
	522	463	10.9	-38.34							
	522	727	18.8	-38.34							
	522	195	11.8	-37.58							
P	522	051	13.3	-37.13							
	522	653	8.5	-37.10							
P	522	211	8.8	-36.73							
	522	629	6.8	-35.16							
	522	419	9.2	-35.14	70						
	522	115	5.3	-34.59							
	522	509	12.6	-34.32							
	522	205	8.9	-34.18							
	522	175	10.5	-33.94							
	522	073	5.4	-32.92							
	522	499	13.3	-32.90		M					
	522	165	9.5	-32.83							
	522	103	13.9	-32.78							
P	522	601	8.5	-32.60							
	522	465	8.9	-31.60							
	522	123	14.6	-31.58							
	522	279	12.5	-31.52							
P	522	611	13.3	-30.84							
	522	145	6.3	-30.00							
	522	229	10.9	-29.51							
P	522	361	13.3	-29.06							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	522	197	16.0	-28.77							
	522	337	10.7	-28.57		M					
	522	157	10.2	-28.08							
	522	615	21.0	-28.08							
P	522	691	15.3	-27.28							
	522	299	8.4	-26.67							
	522	533	6.5	-26.58							
	522	379	12.4	-26.03							
	522	565	12.0	-25.74							
	522	345	9.1	-25.38							
	522	119	9.8	-24.81							
	522	189	12.5	-24.80							
	522	395	18.8	-24.22							
	522	695	9.6	-22.86							
P	522	301	12.3	-22.79							
	522	373	16.8	-22.79							
	522	339	18.8	-22.39							
P	522	351	5.8	-22.33							
	522	659	16.8	-22.32		M					
	522	575	10.3	-22.04							
	522	703	13.7	-21.74							
	522	263	9.5	-21.06							
	522	607	12.3	-20.96							
	522	025	31.7	-20.87							
	522	167	18.8	-19.59							
P	522	371	9.7	-19.46							
P	522	631	18.8	-19.43							
	522	427	13.8	-19.27							
	522	249	15.8	-19.12							
	522	383	10.8	-18.95							
	522	039	24.3	-18.85							
P	522	181	16.5	-18.72							
	522	293	18.8	-18.21							
	522	243	6.7	-17.90							
	522	713	16.8	-17.77							
	522	649	10.9	-17.72							
	522	555	14.6	-17.70							
	522	539	6.0	-17.69							
P	522	031	14.6	-17.20							
	522	705	8.5	-16.83							
	522	023	8.4	-16.67							
	522	529	15.8	-16.57							
P	522	231	10.0	-16.48							
	522	445	15.3	-16.40							
	522	429	17.2	-16.07							
	522	715	18.8	-15.81							
	522	049	10.8	-15.67							
P	522	491	12.4	-15.59							
	522	193	13.7	-15.46							
	522	485	15.2	-15.09							
	522	085	10.5	-14.26							
P	522	501	10.0	-13.85							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	522	323	13.5	-13.55	69						
	522	497	18.8	-13.19							
	522	369	10.4	-13.00							
	522	027	9.7	-12.26							
P	522	411	12.6	-11.57							
P	522	091	5.9	-10.91							
	522	473	15.1	-10.72							
	522	399	12.6	-10.24							
	522	133	12.6	-10.18							
	522	017	9.9	-10.02							
	522	433	16.9	-9.65							
	522	063	11.4	-9.31							
	522	467	18.8	-8.88							
	522	209	16.5	-7.26							
	522	697	18.8	-6.13							
P	522	451	15.7	-5.96							
	522	679	10.9	-5.33		H					
	522	495	12.8	-4.18							
	522	393	18.8	-3.90							
	522	259	9.7	-3.02							
	522	417	14.8	-2.55		H					
	522	313	9.9	-2.10							
	522	685	18.8	-1.88							
	522	619	8.5	-1.45							
	522	273	10.2	-0.58							
	522	283	16.5	-0.32							
	522	077	9.9	-0.30							
P	522	281	8.9	0.41							
	522	309	9.2	0.56							
	522	683	10.7	1.07							
	522	545	16.6	1.11							
P	522	541	8.9	3.08							
	522	597	12.5	5.08							
P	522	161	9.2	5.45							
	522	097	23.3	5.70							
	522	295	13.3	6.20							
	522	519	5.5	7.11							
	522	707	16.8	10.20							
	522	573	16.7	11.00							
	522	319	11.7	12.73		H					
P	522	551	9.9	12.89							
	522	233	8.8	13.79		H					
	522	349	13.5	13.86		H					
	522	033	8.8	17.06							
	522	409	8.8	17.46							
	522	057	24.3	18.57							
	522	633	18.8	19.01							
	522	135	7.9	19.25		H					
	522	585	7.7	19.82							
	522	199	15.6	22.03		H					
P	522	221	8.9	22.53							
P	522	471	16.8	22.65							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
P	522	661	21.1	23.01							
P	522	311	10.7	23.22							
	522	523	9.7	23.62							
	522	185	24.3	24.30							
	522	547	10.1	25.02							
	522	579	11.9	25.76							
	522	677	9.8	28.94							
	522	563	10.4	33.91							
	522	447	11.0	34.92							
P	522	721	17.0	36.89							
	522	605	10.6	39.54							
	522	047	8.4	47.57							
	522	359	17.5	50.11		H					
P	522	061	22.2	59.34							
P	522	291	15.1	71.51							
	522	527	18.8	82.08							
	522	663	18.8	96.73							
P	522	651	18.8	99.58							
	522	403	7.6	193.00	70		209	-20.57	35.98	193.00	-89.00
P	524	126	15.2	-96.61							
	524	008	17.4	-94.89							
	524	102	13.7	-91.01							
	524	110	16.2	-91.00							
	524	082	21.4	-84.13							
	524	012	16.8	-61.49							
	524	052	23.8	-59.16							
	524	070	18.8	-48.36							
	524	120	18.8	-39.60							
P	524	056	16.8	-32.25							
	524	100	7.5	-27.36							
	524	132	17.3	-27.13							
	524	080	21.0	-26.49							
	524	098	18.8	-26.40							
	524	010	5.0	-21.14	15						
	524	050	12.4	-16.90							
	524	068	17.1	-15.69							
	524	034	18.8	-14.61							
P	524	106	22.4	-11.61							
P	524	096	18.8	-11.41							
	524	124	18.5	-11.24							
P	524	066	17.1	-8.48							
	524	040	17.7	-3.54							
	524	122	21.0	2.31							
	524	138	7.2	3.83							
	524	128	18.8	8.57							
	524	104	7.2	11.58							
P	524	116	18.8	22.46							
	524	084	5.0	29.37							
	524	038	11.2	29.71	15						
	524	118	9.7	31.35							
P	524	026	12.6	34.74							
P	524	086	8.5	35.64							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	524	074	18.8	35.68		H					
	524	004	24.4	44.60							
	524	112	21.0	50.87							
	524	032	24.3	54.44							
	524	044	5.4	54.88							
	524	002	31.9	54.99							
P	524	136	6.9	69.02							
	524	094	18.8	81.62							
	524	020	24.3	86.37							
	524	028	9.0	86.59							
	524	062	18.8	92.11							
	524	078	21.4	93.34	15		45	2.08	52.86	93.34	-96.61
	525	477	21.6	-87.50							
	525	333	10.7	-83.78							
P	525	815	10.9	-79.40							
	525	703	10.9	-66.17							
P	525	445	5.5	-52.78							
	525	043	5.3	-43.65							
	525	777	5.1	-40.40							
P	525	145	22.4	-37.95							
	525	709	13.3	-37.24							
	525	147	24.3	-35.54							
	525	163	15.2	-31.49							
	525	789	15.0	-28.16							
	525	039	10.8	-27.69							
P	525	385	20.9	-27.30							
	525	383	13.3	-24.03							
	525	681	13.3	-22.67							
P	525	315	5.2	-15.40							
	525	211	15.8	-15.37	18						
	525	431	15.2	-13.71							
	525	461	10.7	-5.42							
	525	783	21.1	0.22							
	525	817	20.9	0.59							
P	525	165	15.8	3.74							
	525	011	14.7	8.00							
	525	479	10.0	8.03							
	525	439	14.8	10.29							
	525	007	24.4	11.55							
	525	037	11.2	14.41							
	525	481	18.8	16.44							
	525	711	13.3	17.36							
	525	387	16.8	18.29							
P	525	035	5.2	18.82							
	525	241	19.5	19.76							
	525	737	13.5	20.26							
	525	291	16.3	26.23							
	525	401	11.2	29.72	18						
	525	023	11.1	30.68							
	525	289	10.6	30.88							
	525	791	10.3	31.12		H					
P	525	455	12.6	31.16							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	525	419	11.9	34.92							
	525	707	14.2	34.99							
	525	287	11.1	44.37							
P	525	475	14.9	49.59		H					
	525	731	8.8	50.70							
P	525	195	13.3	53.86							
	525	047	10.5	61.56							
	525	367	16.8	66.87							
P	525	005	15.6	67.87							
	525	509	8.5	69.29							
P	525	655	21.0	75.66							
	525	697	21.0	86.63							
P	525	705	13.3	175.22							
	525	031	7.1	234.62	18		54	12.56	56.53	234.62	-87.50
	533	018	9.2	-69.54							
	533	006	16.8	-68.80							
	533	010	8.8	-52.73	3						
	533	008	17.4	-19.91							
P	533	024	15.9	-17.28							
	533	012	18.8	28.57	3						
	533	016	15.2	54.31		H					
P	533	014	10.2	71.58							
	533	020	19.2	87.51	3		9	1.52	60.80	87.51	-69.54
	541	030	16.6	-94.95							
P	541	052	8.8	-93.23		L					
	541	230	13.3	-92.05							
	541	250	16.2	-88.64							
	541	348	17.3	-84.32							
	541	266	9.0	-83.84							
	541	340	15.8	-83.84							
	541	260	8.5	-74.49							
	541	360	31.9	-74.18							
P	541	122	7.8	-72.01							
	541	016	24.3	-65.20							
	541	174	9.3	-62.81							
	541	018	15.8	-62.27		L					
	541	268	7.3	-62.14							
P	541	022	11.9	-61.86							
	541	148	15.1	-54.07							
	541	170	8.3	-54.06							
	541	206	9.1	-53.14							
	541	324	14.3	-50.98							
	541	226	14.9	-48.03							
P	541	212	9.0	-44.61							
	541	358	18.8	-43.57							
	541	086	8.8	-42.44							
P	541	192	16.7	-41.95							
	541	100	11.9	-41.37							
	541	128	16.8	-38.17							
P	541	082	9.8	-37.05							
	541	068	14.8	-33.30							
	541	056	5.1	-32.28							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	541	288	5.5	-32.10							
	541	228	12.0	-29.82							
	541	120	8.3	-29.77	32						
	541	196	12.3	-26.13							
	541	356	11.0	-24.54							
	541	144	10.6	-22.50							
	541	010	9.5	-22.36							
	541	200	8.5	-20.16							
	541	098	16.3	-18.56							
P	541	292	10.5	-16.67							
	541	328	9.1	-15.06							
	541	034	8.3	-12.64							
	541	084	10.7	-12.36							
	541	168	15.1	-11.75							
P	541	312	12.7	-10.29							
	541	258	8.8	-9.94							
P	541	042	11.1	-9.53							
	541	110	8.8	-9.34							
	541	166	9.1	-9.26							
	541	300	5.3	-7.92							
	541	150	9.7	-3.41		M					
	541	244	10.3	-2.91							
	541	020	7.2	0.39							
	541	256	9.5	2.08							
	541	254	18.8	3.23							
	541	238	18.8	4.72							
	541	344	5.1	5.97							
	541	064	8.5	9.76							
	541	106	10.3	13.14							
	541	364	8.5	17.29							
	541	154	6.4	19.86							
	541	180	9.3	28.84							
	541	186	12.8	29.77							
	541	366	7.1	32.90							
	541	368	10.9	34.91	32						
	541	094	12.8	35.31							
P	541	322	11.5	36.47							
	541	248	9.4	37.76							
	541	076	6.6	39.17							
P	541	352	17.0	40.24		H					
P	541	362	20.9	42.42							
	541	118	11.8	44.38							
	541	088	9.3	46.50							
P	541	282	16.8	53.60							
	541	108	9.5	59.82							
P	541	342	6.9	59.82							
	541	270	9.4	63.05							
	541	130	12.1	63.90							
	541	380	10.6	72.69							
	541	006	9.2	73.47							
	541	104	13.9	76.34							
	541	004	13.1	87.02							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	541	236	11.2	91.04							
	541	220	18.8	95.94							
	541	026	8.8	116.10							
	541	264	13.1	118.14							
	541	334	18.8	119.68							
	541	126	18.3	139.87							
	541	044	12.2	141.03							
P	541	012	11.3	143.71							
	541	208	6.8	156.71							
	541	284	8.5	191.68							
P	541	132	16.5	208.18							
	541	374	13.3	221.80							
	541	346	16.8	302.82							
P	541	062	18.8	357.48							
	541	114	10.5	392.32	32		96	18.79	91.73	392.32	-94.95
	561	060	11.6	-93.05							
P	561	072	12.5	-92.39							
	561	064	16.8	-89.82							
P	561	002	9.3	-88.45							
	561	088	10.6	-67.36							
	561	108	15.1	-65.82							
	561	128	8.2	-65.76							
	561	026	11.9	-62.50							
	561	136	13.3	-49.00	9						
	561	138	16.4	-46.60							
	561	176	18.8	-39.29							
P	561	042	7.2	-24.46							
	561	050	12.1	-22.39							
	561	100	13.3	-11.41							
	561	028	19.5	-11.36							
	561	140	16.8	-9.87							
	561	178	8.5	-5.91							
	561	078	7.1	-5.41		M					
P	561	012	7.1	-4.85	10						
P	561	032	20.4	-3.45							
	561	008	7.1	3.84							
P	561	122	16.3	33.49							
	561	048	25.5	55.09							
	561	090	9.4	81.60							
	561	160	12.3	84.20							
	561	040	11.4	87.94							
	561	076	11.8	103.04							
	561	080	16.0	292.63	9		28	-4.19	81.48	292.63	-93.05
	562	004	24.3	-91.68							
P	562	026	17.0	-78.98	2						
P	562	016	11.9	-65.04							
	562	030	9.5	-40.74		M					
	562	018	13.3	3.80	3						
	562	028	10.6	62.55							
	562	024	12.3	134.30	2		7	-10.83	83.34	134.30	-91.68
P	713	039	12.6	-82.39		L					
	713	023	16.2	-72.15							

Pilot	NAICS	Comp	12/08 Age yrs.	% Change 1/05 - 1/09	HLM Groupings	Rank HLM	Count	Mean	Std.Dev	Max	Min
	713	051	9.8	-69.67							
P	713	029	16.0	-59.29	4						
	713	007	15.2	-57.74							
P	713	009	15.1	-55.13							
	713	005	8.8	-37.74							
	713	003	15.1	-13.25							
	713	015	12.2	-1.63	5						
	713	013	46.9	20.00							
	713	035	14.6	57.33							
	713	047	11.8	101.99							
	713	017	15.3	123.86	4		13	-11.22	68.39	123.86	-82.39
	722	028	15.1	-78.74							
	722	020	6.1	-65.99							
	722	066	16.8	-62.81							
	722	052	17.9	-52.36							
P	722	054	10.0	-50.63		L					
	722	016	16.3	-49.05							
	722	060	9.5	-44.70	7						
P	722	004	24.3	-38.13							
	722	058	6.4	-31.45							
	722	008	19.4	-28.49							
	722	030	12.1	-19.85							
P	722	014	18.8	-18.65							
	722	018	18.8	-8.66	6						
P	722	034	13.3	-8.05							
	722	006	24.3	-1.05							
	722	032	24.3	0.69							
P	722	044	23.4	3.05							
	722	022	13.6	27.33							
	722	050	15.8	126.54							
	722	046	38.9	127.07	7		20	-13.70	55.02	127.07	-78.74
P	812	026	17.0	-98.72							
	812	022	12.4	-49.44							
	812	018	17.5	-46.53							
	812	024	17.2	-7.81	4						
	812	008	19.5	-6.29							
	812	030	7.1	-3.28							
	812	004	12.1	3.60	3						
	812	012	8.5	13.22							
	812	002	24.3	18.40							
P	812	006	11.4	33.68		H					
	812	028	20.9	34.99	4	H	11	-9.83	40.36	34.99	-98.72

Count	1290	1288		1288
Mean	14.66	9.88		
Std. Dev	6.17	105.54		
Median	13.67	-13.22		
Max	46.92	1007.75		
Min	5.00	-99.62		

Appendix N: Dependent Variable by Responding Companies Only

Pilot	NAICS	Co. No.	Age yrs.	1/05 - 1/09	Performance
P	541	052	8.8	-93.23	
P	713	039	12.6	-82.39	
	221	001	8.3	-72.93	
P	325	153	8.5	-69.66	
	211	060	6.8	-66.05	
	541	018	15.8	-62.27	
P	311	058	18.8	-61.97	
	441	025	21.0	-61.46	
	325	035	20.5	-56.57	
	334	601	21.8	-51.82	L
	515	009	8.5	-51.58	
P	722	054	10.0	-50.63	
P	325	453	5.2	-46.45	
	312	033	8.8	-45.67	
	522	625	8.9	-44.31	
	522	449	7.9	-43.23	
	562	030	9.5	-40.74	
	522	315	6.2	-40.52	
	237	027	11.9	-40.21	
	334	499	24.3	-34.99	
	522	499	13.3	-32.90	
	334	439	14.4	-30.14	
	333	130	13.8	-29.69	
	522	337	10.7	-28.57	24
	511	159	8.2	-23.97	
	311	084	13.3	-22.94	
	522	659	16.8	-22.32	
P	336	048	14.4	-18.86	
	332	007	9.3	-15.18	
	511	019	9.5	-14.22	
	333	104	23.4	-12.99	
	511	005	13.8	-9.13	
	443	006	11.4	-6.95	
	561	078	7.1	-5.41	M
	522	679	10.9	-5.33	
	541	150	9.7	-3.41	
P	423	135	13.4	-3.13	
	522	417	14.8	-2.55	
	339	087	16.8	-0.23	
	325	277	8.5	3.56	
	334	131	18.8	4.49	
P	237	001	10.2	5.56	
	334	477	11.0	12.64	
	522	319	11.7	12.73	
	522	233	8.8	13.79	
	522	349	13.5	13.86	
	221	049	21.1	15.34	
P	325	303	9.8	15.55	24

Pilot	NAICS	Co. No.	Age yrs.	1/05 - 1/09	Performance
	522	135	7.9	19.25	
	335	009	24.3	21.11	
	522	199	15.6	22.03	
P	311	038	14.9	25.87	
	525	791	10.3	31.12	
P	812	006	11.4	33.68	
	812	028	20.9	34.99	
	524	074	18.8	35.68	
P	221	105	8.8	37.75	
	221	141	27.0	39.33	H
P	541	352	17.0	40.24	
P	525	475	14.9	49.59	
	522	359	17.5	50.11	
	533	016	15.2	54.31	
	333	146	16.8	55.55	
	322	026	23.1	56.80	
	336	074	22.4	58.29	
	221	101	18.8	69.92	
	211	146	16.0	100.01	
	326	036	15.0	152.48	
	334	191	15.0	154.59	
	325	449	16.8	181.87	
	334	421	8.5	273.47	
	333	070	16.8	978.17	24
	322	006	16.2	Chapter 11	10 cents/share
	334	229	9.8	NA for data range	

Count	74	72
Mean	13.81	17.63
Std. Dev.	5.09	130.42
Median	13.46	-3.27
Max	27.00	978.17
Min	5.17	-93.23

Appendix O: Process Ranking Conversion H_1

Resp ID	1H,2M,3L Rank	Company	Process Rank 1 (abreviated)	Process Rank 2 (abreviated)	Process Rank 3 (abreviated)	Process Rank 4 (abreviated)	Identity Process Rank	Priority Process Rank	Background Process Rank	Mandated Process Rank
2	2M	3360.048	I	B	M	P	1	4	2	3
3	2M	4230.135	P	B	I	M	3	1	2	4
4	3L	7220.054	I	P	B	M	1	2	3	4
5	2M	4230.135	M	B	I	P	3	4	2	1
6	1H	5250.475	P	B	I	M	3	1	2	4
7	3L	7130.039	I	B	P	M	1	3	2	4
8	1H	8120.006	P	M	B	I	4	1	3	2
9	3L	5410.052	I	P	B	M	1	2	3	4
10	1H	5410.352	P	M	B	I	4	1	3	2
11	1H	3250.303	B	M	P	I	4	3	1	2
12	2M	2210.105	I	P	B	M	1	2	3	4
13	2M	2370.001	B	P	M	I	4	2	1	3
14	1H	3110.038	B	M	P	I	4	3	1	2
15	3L	3250.153	B	P	I	M	3	2	1	4
16	3L	3110.058	B	M	I	P	3	4	1	2
17	3L	3330.104	M	B	I	P	3	4	2	1
18	3L	3110.084	B	M	P	I	4	3	1	2
19	2M	5110.159	I	B	P	M	1	3	2	4
20	3L	5220.625	M	B	P	I	4	3	2	1
21	3L	5220.315	M	I	P	B	2	3	4	1
22	2M	5620.030	M	I	P	B	2	3	4	1
23	1H	5220.349	I	P	M	B	1	2	4	3
24	1H	2210.101	M	P	I	B	3	2	4	1
25	3L	3120.033	P	B	M	I	4	1	2	3
26	2M	3340.439	B	P	I	M	3	2	1	4
29	1H	5330.016	B	I	P	M	2	3	1	4
30	1H	5220.319	I	M	P	B	1	3	4	2
31	1H	3330.070	P	B	I	M	3	1	2	4
32	2M	3340.499	B	M	I	P	3	4	1	2
33	2M	3340.601	I	B	M	P	1	4	2	3
34	3L	2210.049	P	M	B	I	4	1	3	2
35	1H	5220.359	P	I	B	M	2	1	3	4
36	1H	5240.074	P	I	M	B	2	1	4	3
37	1H	5250.791	B	M	P	I	4	3	1	2
38	2M	5220.337	M	P	I	B	3	2	4	1
39	1H	5220.135	I	M	P	B	1	3	4	2
40	1H	3360.074	P	M	B	I	4	1	3	2
41	2M	3390.087	P	M	B	I	4	1	3	2
42	1H	3340.421	P	M	B	I	4	1	3	2
43	2M	5150.009	P	I	B	M	2	1	3	4
44	2M	3250.277	M	P	I	B	3	2	4	1
45	1H	3220.026	B	I	M	P	2	4	1	3
46	3L	2370.027	B	M	P	I	4	3	1	2
47	3L	5410.018	P	M	B	I	4	1	3	2
48	1H	5220.199	B	M	P	I	4	3	1	2
49	1H	5220.679	M	B	P	I	4	3	2	1
50	3L	3320.007	B	M	P	I	4	3	1	2
51	3L	2110.060	B	I	P	M	2	3	1	4
52	1H	3340.191	B	I	P	M	2	3	1	4
53	1H	5220.233	M	B	P	I	4	3	2	1
54	3L	5220.449	M	I	P	B	2	3	4	1
55	2M	5110.019	I	P	B	M	1	2	3	4
56	2M	3330.146	P	I	M	B	2	1	4	3
57	2M	5220.659	M	P	I	B	3	2	4	1
58	3L	2210.001	P	B	I	M	3	1	2	4

Resp ID	1H,2M,3L Rank	Company	Process Rank 1 (abreviated)	Process Rank 2 (abreviated)	Process Rank 3 (abreviated)	Process Rank 4 (abreviated)	Identity Process Rank	Priority Process Rank	Background Process Rank	Mandated Process Rank
59	1H	3250.449	M	I	B	P	2	4	3	1
60	2M	5610.078	B	M	P	I	4	3	1	2
61	2M	5220.499	M	B	P	I	4	3	2	1
62	2M	2210.141	M	B	I	P	3	4	2	1
63	1H	3260.036	B	P	I	M	3	2	1	4
64	2M	5110.005	B	M	I	P	3	4	1	2
65	2M	4430.006	B	M	P	I	4	3	1	2
66	2M	3350.009	I	B	P	M	1	3	2	4
67	1H	3340.131	P	I	M	B	2	1	4	3
68	2M	5410.150	M	P	B	I	4	2	3	1
69	3L	3250.035	P	M	B		5	1	3	2
71	1H	3340.477	B	I	P	M	2	3	1	4
73	1H	5220.417	B	M	P	I	4	3	1	2
74	1H	8120.028	B	M	P	I	4	3	1	2
75	2M	2110.146	B	M			5	5	1	2
76	3L	4410.025	I	P	M	B	1	2	4	3

Appendix P: Financial Nonfinancial H_2 Kruskal-Wallis Ranked Means by Clockspeed

Resp ID	1H,2M,3L Rank	Product Change (1,2,3)	Process Change	Perf. Measure Change	Financial Measures	Financial Measures Ranked w/ ties	Non-Financial Measures	Nonfinancial Measures Ranked w/ ties
6	1H	1	1	1	10	35.5	28	42
8	1H	1	2	1	5	10.5	30	45
10	1H	2	2	2	6	15.5	26	40
11	1H	1	1	1	20	58	65	63
14	1H	1	1	2	10	35.5	23	38.5
23	1H	1	2	3	10	35.5	21	37
24	1H	3	1	1	300	70	550	70
29	1H	3	2		8	24	10	14
30	1H	1	1	1	50	68.5	150	67
31	1H	1	1	1	10	35.5	40	54
35	1H	1	1	2	8	24	14	25.5
36	1H	2	2	2	5	10.5	20	35
37	1H	2	1	2	9	26.5	23	38.5
39	1H	1	1	1	40	67	30	45
40	1H	1	1	1	13	47.5	230	69
42	1H	2	2	2	7	20	5	3
45	1H	3	1	2	25	64	35	49.5
48	1H	1	1	2	20	58	30	45
49	1H	1	1	2	15	51.5	16	29.5
52	1H	1	1	1	12	45	44	58.5
53	1H	1	1		15	51.5	20	35
59	1H	2	2	1	25	64	90	66
63	1H	1	1	2	12	45	28	42
67	1H	1	1	1	4	5	11	18.5
71	1H	1	1		15	51.5	35	49.5
73	1H	1	1	1	20	58	70	64
74	1H	2	1	2	20	58	40	54
High Performer Average Ranked Means						42.055556		44.3703704
2	2M	1	1	1	10	35.5	13	22
3	2M	1	1	1	4	5	14	25.5
5	2M	1	1	3	20	58	60	62
12	2M	2	2	1	20	58	220	68
13	2M	1	1	1	10	35.5	10	14
19	2M	1	1	1	10	35.5	16	29.5
22	2M	3	2	2	7	20	11	18.5
26	2M	1	1	2	7	20	13	22
32	2M	2	2	2	10	35.5	28	42
33	2M	1	1	1	7	20	7	6
38	2M	1	1	3	4	5	10	14
41	2M	1	2	2	20	58	41	56
43	2M	1	2	2	10	35.5	35	49.5
44	2M	2	2	1	13	47.5	13	22
55	2M	1	1	1	10	35.5	14	25.5
56	2M	1	1	2	5	10.5	18	31.5
57	2M	1	1	1	35	66	10	14
60	2M	1	1	2	10	35.5	11	18.5
61	2M	1	1	1	12	45	51	60
62	2M	3	2	1	6	15.5	37	52
64	2M	1	1	1	5	10.5	40	54
65	2M	1	1	1	10	35.5	19	33
66	2M	1	1		7	20	11	18.5
68	2M	3	1	1	15	51.5	20	35
75	2M	3	1	3	10	35.5	3	2
Medium Performer Average Ranked Means						33.2		31.8
4	3L	1	1	1	50	68.5	55	61
7	3L	1	2	1	4	5	42	57
9	3L	1	1	2	20	58	35	49.5
15	3L	1			14	49	18	31.5
16	3L		1	2	9	26.5	15	28
18	3L	1	1	1	3	2	9	10.5
20	3L	1	1	2	10	35.5	14	25.5
21	3L	1	2	2	8	24	9	10.5
25	3L	2	3	1	6	15.5	8	8.5
28	3L	1	1	2	10	35.5	10	14
34	3L	3	3	3	5	10.5	7	6
46	3L		2		2	1	8	8.5
47	3L	1	1	2	10	35.5	7	6
51	3L	3	3	2	5	10.5	0	1
54	3L	2	2	2	6	15.5	6	4
58	3L	2	1	2	4	5	32	47
69	3L	1	1	1	25	64	44	58.5
76	3L	2	1	1	20	58	80	65
Low Performer Average Ranked Means						28.861111		27.333333

Resp ID	1H,2M ,3L Rank	Product Change (1, 2, 3)	Financial Measures	Financial Measures Ranked w/ ties	Non-Financial Measures	Nonfinancial Measures Ranked w/ ties	Financial Means Avg	Count	Non-financial Means Avg
6	1H	1	10	35.5	28	42			
8	1H	1	5	10.5	30	45			
11	1H	1	20	58	65	63			
14	1H	1	10	35.5	23	38.5			
23	1H	1	10	35.5	21	37			
30	1H	1	50	68.5	150	67			
31	1H	1	10	35.5	40	54			
35	1H	1	8	24	14	25.5			
39	1H	1	40	67	30	45			
40	1H	1	13	47.5	230	69			
48	1H	1	20	58	30	45			
49	1H	1	15	51.5	16	29.5			
52	1H	1	12	45	44	58.5			
53	1H	1	15	51.5	20	35			
63	1H	1	12	45	28	42			
67	1H	1	4	5	11	18.5			
71	1H	1	15	51.5	35	49.5			
73	1H	1	20	58	70	64	43.5	18	46
2	2M	1	10	35.5	13	22			
3	2M	1	4	5	14	25.5			
5	2M	1	20	58	60	62			
13	2M	1	10	35.5	10	14			
19	2M	1	10	35.5	16	29.5			
26	2M	1	7	20	13	22			
33	2M	1	7	20	7	6			
38	2M	1	4	5	10	14			
41	2M	1	20	58	41	56			
43	2M	1	10	35.5	35	49.5			
55	2M	1	10	35.5	14	25.5			
56	2M	1	5	10.5	18	31.5			
57	2M	1	35	66	10	14			
60	2M	1	10	35.5	11	18.5			
61	2M	1	12	45	51	60			
64	2M	1	5	10.5	40	54			
65	2M	1	10	35.5	19	33			
66	2M	1	7	20	11	18.5	31.47222	18	30.86111
4	3L	1	50	68.5	55	61			
7	3L	1	4	5	42	57			
9	3L	1	20	58	35	49.5			
15	3L	1	14	49	18	31.5			
18	3L	1	3	2	9	10.5			
20	3L	1	10	35.5	14	25.5			
21	3L	1	8	24	9	10.5			
28	3L	1	10	35.5	10	14			
47	3L	1	10	35.5	7	6			
69	3L	1	25	64	44	58.5	37.7	10	32.4
10	1H	2	6	15.5	26	40			
36	1H	2	5	10.5	20	35			
37	1H	2	9	26.5	23	38.5			
42	1H	2	7	20	5	3			
59	1H	2	25	64	90	66			
74	1H	2	20	58	40	54	32.41667	6	39.41667
12	2M	2	20	58	220	68			
32	2M	2	10	35.5	28	42			
44	2M	2	13	47.5	13	22	47	3	44
25	3L	2	6	15.5	8	8.5			
54	3L	2	6	15.5	6	4			
58	3L	2	4	5	32	47			
76	3L	2	20	58	80	65	23.5	4	31.125
24	1H	3	300	70	550	70			
29	1H	3	8	24	10	14			
45	1H	3	25	64	35	49.5	52.66667	3	44.5
22	2M	3	7	20	11	18.5			
62	2M	3	6	15.5	37	52			
68	2M	3	15	51.5	20	35			
75	2M	3	10	35.5	3	2	30.625	4	26.875
34	3L	3	5	10.5	7	6			
51	3L	3	5	10.5	0	1	10.5	2	3.5
16	3L		9	26.5	15	28			
46	3L		2	1	8	8.5			

Resp ID	1H,2M ,3L Rank	Product Change (1, 2, 3)	Process Change	Perf. Measure Change	Financial Measures	Financial Measures Ranked w/ ties	Non-Financial Measures	Nonfinancial Measures Ranked w/ ties	Financial Means Avg	Count	Non-financial Means Avg
6	1H		1		10	35.5	28	42			
11	1H		1		20	58	65	63			
14	1H		1		10	35.5	23	38.5			
24	1H		1		300	70	550	70			
30	1H		1		50	68.5	150	67			
31	1H		1		10	35.5	40	54			
35	1H		1		8	24	14	25.5			
37	1H		1		9	26.5	23	38.5			
39	1H		1		40	67	30	45			
40	1H		1		13	47.5	230	69			
45	1H		1		25	64	35	49.5			
48	1H		1		20	58	30	45			
49	1H		1		15	51.5	16	29.5			
52	1H		1		12	45	44	58.5			
53	1H		1		15	51.5	20	35			
63	1H		1		12	45	28	42			
67	1H		1		4	5	11	18.5			
71	1H		1		15	51.5	35	49.5			
73	1H		1		20	58	70	64			
74	1H		1		20	58	40	54	47.775	20	47.9
2	2M		1		10	35.5	13	22			
3	2M		1		4	5	14	25.5			
5	2M		1		20	58	60	62			
13	2M		1		10	35.5	10	14			
19	2M		1		10	35.5	16	29.5			
26	2M		1		7	20	13	22			
33	2M		1		7	20	7	6			
38	2M		1		4	5	10	14			
55	2M		1		10	35.5	14	25.5			
56	2M		1		5	10.5	18	31.5			
57	2M		1		35	66	10	14			
60	2M		1		10	35.5	11	18.5			
61	2M		1		12	45	51	60			
64	2M		1		5	10.5	40	54			
65	2M		1		10	35.5	19	33			
66	2M		1		7	20	11	18.5			
68	2M		1		15	51.5	20	35			
75	2M		1		10	35.5	3	2	31.11111	18	27.05556
4	3L		1		50	68.5	55	61			
9	3L		1		20	58	35	49.5			
16	3L		1		9	26.5	15	28			
18	3L		1		3	2	9	10.5			
20	3L		1		10	35.5	14	25.5			
28	3L		1		10	35.5	10	14			
47	3L		1		10	35.5	7	6			
58	3L		1		4	5	32	47			
69	3L		1		25	64	44	58.5			
76	3L		1		20	58	80	65	38.85	10	36.5
8	1H		2		5	10.5	30	45			
10	1H		2		6	15.5	26	40			
23	1H		2		10	35.5	21	37			
29	1H		2		8	24	10	14			
36	1H		2		5	10.5	20	35			
42	1H		2		7	20	5	3			
59	1H		2		25	64	90	66	25.71429	7	34.28571
12	2M		2		20	58	220	68			
22	2M		2		7	20	11	18.5			
32	2M		2		10	35.5	28	42			
41	2M		2		20	58	41	56			
43	2M		2		10	35.5	35	49.5			
44	2M		2		13	47.5	13	22			
62	2M		2		6	15.5	37	52	38.57143	7	44
7	3L		2		4	5	42	57			
21	3L		2		8	24	9	10.5			
46	3L		2		2	1	8	8.5			
54	3L		2		6	15.5	6	4	11.375	4	20
25	3L		3		6	15.5	8	8.5			
34	3L		3		5	10.5	7	6			
51	3L		3		5	10.5	0	1	12.16667	3	5.166667
15	3L				14	49	18	31.5			

Resp ID	1H,2M ,3L Rank	Product Change (1, 2, 3)	Process Change	Perf. Measure Change	Financial Measures	Financial Measures Ranked w/ ties	Non-Financial Measures	Nonfinancial Measures Ranked w/ ties	Financial Means Avg	Count	Non-financial Means Avg
6	1H			1	10	35.5	28	42			
8	1H			1	5	10.5	30	45			
11	1H			1	20	58	65	63			
24	1H			1	300	70	550	70			
30	1H			1	50	68.5	150	67			
31	1H			1	10	35.5	40	54			
39	1H			1	40	67	30	45			
40	1H			1	13	47.5	230	69			
52	1H			1	12	45	44	58.5			
59	1H			1	25	64	90	66			
67	1H			1	4	5	11	18.5			
73	1H			1	20	58	70	64	47.04167	12	55.16667
2	2M			1	10	35.5	13	22			
3	2M			1	4	5	14	25.5			
12	2M			1	20	58	220	68			
13	2M			1	10	35.5	10	14			
19	2M			1	10	35.5	16	29.5			
33	2M			1	7	20	7	6			
44	2M			1	13	47.5	13	22			
55	2M			1	10	35.5	14	25.5			
57	2M			1	35	66	10	14			
61	2M			1	12	45	51	60			
62	2M			1	6	15.5	37	52			
64	2M			1	5	10.5	40	54			
65	2M			1	10	35.5	19	33			
68	2M			1	15	51.5	20	35	35.46429	14	32.89286
4	3L			1	50	68.5	55	61			
7	3L			1	4	5	42	57			
18	3L			1	3	2	9	10.5			
25	3L			1	6	15.5	8	8.5			
69	3L			1	25	64	44	58.5			
76	3L			1	20	58	80	65	35.5	6	43.41667
10	1H			2	6	15.5	26	40			
14	1H			2	10	35.5	23	38.5			
35	1H			2	8	24	14	25.5			
36	1H			2	5	10.5	20	35			
37	1H			2	9	26.5	23	38.5			
42	1H			2	7	20	5	3			
45	1H			2	25	64	35	49.5			
48	1H			2	20	58	30	45			
49	1H			2	15	51.5	16	29.5			
63	1H			2	12	45	28	42			
74	1H			2	20	58	40	54	37.13636	11	36.40909
22	2M			2	7	20	11	18.5			
26	2M			2	7	20	13	22			
32	2M			2	10	35.5	28	42			
41	2M			2	20	58	41	56			
43	2M			2	10	35.5	35	49.5			
56	2M			2	5	10.5	18	31.5			
60	2M			2	10	35.5	11	18.5	30.71429	7	34
9	3L			2	20	58	35	49.5			
16	3L			2	9	26.5	15	28			
20	3L			2	10	35.5	14	25.5			
21	3L			2	8	24	9	10.5			
28	3L			2	10	35.5	10	14			
47	3L			2	10	35.5	7	6			
51	3L			2	5	10.5	0	1			
54	3L			2	6	15.5	6	4			
58	3L			2	4	5	32	47	27.33333	9	20.61111
23	1H			3	10	35.5	21	37	35.5	1	37
5	2M			3	20	58	60	62			
38	2M			3	4	5	10	14			
75	2M			3	10	35.5	3	2	32.83333	3	26
34	3L			3	5	10.5	7	6	10.5	1	6
29	1H				8	24	10	14			
53	1H				15	51.5	20	35			
71	1H				15	51.5	35	49.5			
66	2M				7	20	11	18.5			
15	3L				14	49	18	31.5			
46	3L				2	1	8	8.5			

Appendix Q: H_3 Cramer's Phi

Cramers Phi (V)

High Product Clockspeed Performance				
Observed	High	Med	Low	Total
Financial	43.50	31.47	37.70	112.67
Nonfinancial	46.00	30.86	32.40	109.26
Total	89.50	62.33	70.10	221.93
Count	18.00	18.00	10.00	46.00
Expected				
Financial	45.44	31.65	35.59	
Nonfinancial	44.06	30.69	34.51	
Observed	Expected	O - E	(O-E)^2	(O-E)^2/E
43.50	45.44	-1.94	3.755	0.082643
46.00	44.06	1.94	3.755	0.085223
31.47	31.65	-0.17	0.030	0.000951
30.86	30.69	0.17	0.030	0.000981
37.7	35.59	2.11	4.458	0.125251
32.4	34.51	-2.11	4.458	0.129161
df =2	Chi Square at 0.05 = 5.991			0.424208

$\varphi_c=(\chi^2/(N(k-1)))^{1/2}$ where N = Sample size

$\varphi_c=$ 0.10 k = smaller of R and C

Cramers Phi (V)

High Process Clockspeed Performance				
Observed	High	Med	Low	Total
Financial	47.78	31.11	38.85	117.74
Nonfinancial	47.90	27.06	36.50	111.46
Total	95.68	58.17	75.35	229.19
Count	20.00	18.00	10.00	48.00
Expected				
Financial	49.15	29.88	38.71	
Nonfinancial	46.53	28.29	36.64	
Observed	Expected	O - E	(O-E)^2	(O-E)^2/E
47.78	49.15	-1.37	1.886	0.038378
47.90	46.53	1.37	1.886	0.040541
31.11	29.88	1.23	1.515	0.050698
27.06	28.29	-1.23	1.515	0.053555
38.85	38.71	0.14	0.020	0.000525
36.5	36.64	-0.14	0.020	0.000555
df =2	Chi Square at 0.05 = 5.991			0.184252

$\varphi_c=(\chi^2/(N(k-1)))^{1/2}$ where N = Sample size

$\varphi_c=$ 0.06 k = smaller of R and C

Cramers Phi (V)

High Measurment System Clockspeed Performance				
Observed	High	Med	Low	Total
Financial	47.04	35.46	35.50	118.01
Nonfinancial	55.17	32.89	43.42	131.48
Total	102.21	68.36	78.92	249.48
Count	12.00	14.00	6.00	32.00
Expected				
Financial	48.34	32.33	37.33	
Nonfinancial	53.86	36.02	41.59	
Observed	Expected	O - E	(O-E)^2	(O-E)^2/E
47.04	48.34	-1.30	1.698	0.035132
55.17	53.86	1.30	1.698	0.031532
35.46	32.33	3.13	9.804	0.303214
32.89	36.02	-3.13	9.804	0.272148
35.5	37.33	-1.83	3.341	0.089507
43.4166667	41.59	1.83	3.341	0.080337
df =2	Chi Square at 0.05 = 5.991			0.811869

$\varphi_c=(\chi^2/(N(k-1)))^{1/2}$ where N = Sample size

$\varphi_c=$ 0.16 k = smaller of R and C

Medium Product Clockspeed Performance				
Observed	High	Med	Low	Total
Financial	32.42	47.00	23.50	102.92
Nonfinancial	39.42	44.00	31.13	114.54
Total	71.83	91.00	54.63	217.46
Count	6.00	3.00	4.00	13.00
Expected				
Financial	34.00	43.07	25.85	
Nonfinancial	37.84	47.93	28.77	
Observed	Expected	O - E	(O-E)^2	(O-E)^2/E
32.42	34.00	-1.58	2.496	0.073426
39.42	37.84	1.58	2.496	0.065974
47.00	43.07	3.93	15.463	0.359051
44.00	47.93	-3.93	15.463	0.32261
23.5	25.85	-2.35	5.534	0.214056
31.125	28.77	2.35	5.534	0.192331
df =2	Chi Square at 0.05 = 5.991			1.227447

$\varphi_c=(\chi^2/(N(k-1)))^{1/2}$ where N = Sample size

$\varphi_c=$ 0.31 k = smaller of R and C

Medium Process Clockspeed Performance				
Observed	High	Med	Low	Total
Financial	25.71	38.57	11.38	75.66
Nonfinancial	34.29	44.00	20.00	98.29
Total	60.00	82.57	31.38	173.95
Count	7.00	7.00	4.00	18.00
Expected				
Financial	26.10	35.92	13.65	
Nonfinancial	33.90	46.66	17.73	
Observed	Expected	O - E	(O-E)^2	(O-E)^2/E
25.71	26.10	-0.38	0.147	0.00564
34.29	33.90	0.38	0.147	0.004342
38.57	35.92	2.66	7.053	0.196369
44.00	46.66	-2.66	7.053	0.151165
11.375	13.65	-2.27	5.162	0.378264
20	17.73	2.27	5.162	0.291189
df =2	Chi Square at 0.05 = 5.991			1.026969

$\varphi_c=(\chi^2/(N(k-1)))^{1/2}$ where N = Sample size

$\varphi_c=$ 0.24 k = smaller of R and C

Medium Measurment System Clockspeed Performance				
Observed	High	Med	Low	Total
Financial	37.14	30.71	27.33	95.18
Nonfinancial	36.41	34.00	20.61	91.02
Total	73.55	64.71	47.94	186.20
Count	11.00	7.00	9.00	27.00
Expected				
Financial	37.60	33.08	24.51	
Nonfinancial	35.95	31.63	23.44	
Observed	Expected	O - E	(O-E)^2	(O-E)^2/E
37.14	37.60	-0.46	0.210	0.005595
36.41	35.95	0.46	0.210	0.005851
30.71	33.08	-2.37	5.600	0.169279
34.00	31.63	2.37	5.600	0.177023
27.3333333	24.51	2.83	7.981	0.325644
20.6111111	23.44	-2.83	7.981	0.34054
df =2	Chi Square at 0.05 = 5.991			1.023934

$\varphi_c=(\chi^2/(N(k-1)))^{1/2}$ where N = Sample size

$\varphi_c=$ 0.19 k = smaller of R and C

Low Product Clockspeed Performance				
Observed	High	Med	Low	Total
Financial	52.67	30.63	10.50	93.79
Nonfinancial	44.50	26.88	3.50	74.88
Total	97.17	57.50	14.00	168.67
Count	3.00	4.00	2.00	9.00
Expected				
Financial	54.03	31.97	7.79	
Nonfinancial	43.13	25.53	6.21	
Observed	Expected	O - E	(O-E)^2	(O-E)^2/E
52.67	54.03	-1.37	1.865	0.034508
44.50	43.13	1.37	1.865	0.043227
30.63	31.97	-1.35	1.821	0.056951
26.88	25.53	1.35	1.821	0.071339
10.5	7.79	2.71	7.371	0.946785
3.5	6.21	-2.71	7.371	1.185984
df =2	Chi Square at 0.05 = 5.991			2.338793

$\varphi_c=(\chi^2/(N(k-1)))^{1/2}$ where N = Sample size

$\varphi_c=$ 0.51 k = smaller of R and C

Low Process Clockspeed Performance				
Observed	High	Med	Low	Total
Financial	0.00	0.00	12.17	12.17
Nonfinancial	0.00	0.00	5.17	5.17
Total	0.00	0.00	17.33	17.33
Count	0.00	0.00	3.00	3.00
Expected				
Financial	0.00	0.00	12.17	
Nonfinancial	0.00	0.00	5.17	
Observed	Expected	O - E	(O-E)^2	(O-E)^2/E
0.00	0.00	0.00	0.000	#DIV/0!
0.00	0.00	0.00	0.000	#DIV/0!
0.00	0.00	0.00	0.000	#DIV/0!
0.00	0.00	0.00	0.000	#DIV/0!
12.1666667	12.17	0.00	0.000	0
5.16666667	5.17	0.00	0.000	0
df =2	Chi Square at 0.05 = 5.991			#DIV/0!

$\varphi_c=(\chi^2/(N(k-1)))^{1/2}$ where N = Sample size

$\varphi_c=$ #DIV/0! k = smaller of R and C

Low Measurment System Clockspeed Performance				
Observed	High	Med	Low	Total
Financial	35.50	32.83	10.50	78.83
Nonfinancial	37.00	26.00	6.00	69.00
Total	72.50	58.83	16.50	147.83
Count	1.00	3.00	1.00	5.00
Expected				
Financial	38.66	31.37	8.80	
Nonfinancial	33.84	27.46	7.70	
Observed	Expected	O - E	(O-E)^2	(O-E)^2/E
35.50	38.66	-3.16	9.993	0.258484
37.00	33.84	3.16	9.993	0.295321
32.83	31.37	1.46	2.132	0.067941
26.00	27.46	-1.46	2.132	0.077623
10.5	8.80	1.70	2.894	0.328935
6	7.70	-1.70	2.894	0.375812
df =2	Chi Square at 0.05 = 5.991			1.404115

$\varphi_c=(\chi^2/(N(k-1)))^{1/2}$ where N = Sample size

$\varphi_c=$ 0.53 k = smaller of R and C

Appendix R: Number of Balanced Scorecard Categories Used

Resp ID	1H,2M ,3L Rank	Company	Financial Measures	Internal Operating Measures	Employee Related Measures	Customer Measures	BSC Used
2	2M	3360.048	10	5	5	3	4
3	2M	4230.135	4	7	2	5	4
4	3L	7220.054	50	20	15	20	4
5	2M	4230.135	20	30	5	25	4
6	1H	5250.475	10	12	6	10	4
7	3L	7130.039	4	20	2	20	4
8	1H	8120.006	5	20	5	5	4
9	3L	5410.052	20	20	5	10	4
10	1H	5410.352	6	8	10	8	4
11	1H	3250.303	20	30	15	20	4
12	2M	2210.105	20	150	20	50	4
13	2M	2370.001	10	3	4	3	4
14	1H	3110.038	10	10	5	8	4
15	3L	3250.153	14	15	0	3	3
16	3L	3110.058	9	8	4	3	4
18	3L	3110.084	3	3	2	4	4
19	2M	5110.159	10	5	3	8	4
20	3L	5220.625	10	2	5	7	4
21	3L	5220.315	8	2	3	4	4
22	2M	5620.030	7	2	5	4	4
23	1H	5220.349	10	10	7	4	4
24	1H	2210.101	300	400	50	100	4
25	3L	3120.033	6	5	0	3	3
26	2M	3340.439	7	10	0	3	3
28	3L	3330.130	10	10	0	0	2
29	1H	5330.016	8	5	3	2	4
30	1H	5220.319	50	100	25	25	4
31	1H	3330.070	10	20	10	10	4
32	2M	3340.499	10	15	5	8	4
33	2M	3340.601	7	3	2	2	4
34	3L	2210.049	5	5	1	1	4
35	1H	5220.359	8	5	5	4	4
36	1H	5240.074	5	15	2	3	4
37	1H	5250.791	9	12	4	7	4
38	2M	5220.337	4	5	3	2	4
39	1H	5220.135	40	10	10	10	4
40	1H	3360.074	13	200	10	20	4
41	2M	3390.087	20	25	6	10	4
42	1H	3340.421	7	3	0	2	3
43	2M	5150.009	10	20	5	10	4
44	2M	3250.277	13	8	4	1	4
45	1H	3220.026	25	15	15	5	4
46	3L	2370.027	2	4	2	2	4
47	3L	5410.018	10	4	2	1	4
48	1H	5220.199	20	20	5	5	4
49	1H	5220.679	15	10	3	3	4
51	3L	2110.060	5	0	0	0	1
52	1H	3340.191	12	24	10	10	4
53	1H	5220.233	15	10	2	8	4

Resp ID	1H,2M ,3L Rank	Company	Financial Measures	Internal Operating Measures	Employee Related Measures	Customer Measures	BSC Used
54	3L	5220.449	6	1	1	4	4
55	2M	5110.019	10	5	4	5	4
56	2M	3330.146	5	5	7	6	4
57	2M	5220.659	35	0	0	10	2
58	3L	2210.001	4	30	2	0	3
59	1H	3250.449	25	50	10	30	4
60	2M	5610.078	10	5	5	1	4
61	2M	5220.499	12	15	24	12	4
62	2M	2210.141	6	7	25	5	4
63	1H	3260.036	12	12	6	10	4
64	2M	5110.005	5	25	5	10	4
65	2M	4430.006	10	6	10	3	4
66	2M	3350.009	7	5	4	2	4
67	1H	3340.131	4	6	1	4	4
68	2M	5410.150	15	10	5	5	4
69	3L	3250.035	25	30	4	10	4
71	1H	3340.477	15	20	5	10	4
73	1H	5220.417	20	40	15	15	4
74	1H	8120.028	20	20	10	10	4
75	2M	2110.146	10	1	2	0	3
76	3L	4410.025	20	50	20	10	4

Appendix S: Dissertation Survey

Dissertation Survey

Consent Form

Web-Based Survey

Performance Measures for Managerial Decision Making: Performance Measurement Synergies in Multi-Attribute Performance Measurement Systems

You are invited to participate in a research study conducted by Robert A. Fowke from Portland State University, Systems Science: Business Administration. The researcher hopes to learn the impact of use of different performance measures, varied feedback lags, and distribution of performance measurement information on business performance, in partial fulfillment of the requirements for a doctoral degree, under the supervision of Dr. Beverly Fuller. You were selected as a possible participant in this study based on your employment in a company included in North American Industrial Classification System (NAICS) categories under review.

If you decide to participate, you will be asked to complete the following questionnaire regarding performance measurement criteria and processes in your company/department.

Any information that is obtained in connection with this study and that can be linked to you or identify you will be kept confidential. This information will be kept confidential by coding of companies and participants (Company XXXX, Participant 1 – x). Each participant has the option to receive results of the study upon request.

Your participation is voluntary. You do not have to take part in this study, and it will not affect your relationship with your company or Portland State University. You may also withdraw from this study at any time without affecting your relationship with your company or Portland State University.

If you have concerns or problems about your participation in this study or your rights as a research subject, please contact the Human Subjects Research Review Committee, Office of Research and Sponsored Projects, 600 Unitus Bldg., Portland State University, (503) 725-4288 / 1-877-480-4400.

If you have questions about the study itself, contact Robert Fowke at Portland State University, c/o Dr. Beverly Fuller, SBA.

Clicking the submit button at the end of the survey indicates that you have read and understand the above information and agree to take part in this study. Please understand that you may withdraw your consent at any time without penalty, and that, by not continuing, you are not waiving any legal claims, rights or remedies. The researcher will provide you with a copy of this form for your own records upon request.

Results of the study will be available to participants upon request.

1) Please enter your company code.

Format: 9999.999

2) How frequently does your product change/improve? (check most appropriate)

○ < 3 years ○ 3 - 10 years ○ > 10 years ○ Don't know

3) How frequently do your technical processes change/improve? (check most appropriate)

○ <3 years ○ 3 - 10 years ○ >10 years ○ Don't know

4) How frequently does your company or department change its performance measurement system? (select one)

○ <3 years ○ 3 - 10 years ○ >10 years ○ Don't know

5) What is your position in the company? (select one)

○ Executive ○ VP ○ Front line Supervisor ○ Other (please specify)

If you selected other, please specify:

6) In which department do you work? (select one)

○ Corporate ○ HR ○ Finance ○ Marketing ○ Production ○ Engineering ○ IT ○ Other (please specify)

If you selected other, please specify:

7) **Estimate the Number of Financial Measures you use to monitor performance, or which are used to measure your performance.** (see following sample list to help estimate number of measures used)

Sales; Capital Expenditures; Maintenance Expenditures; Operating Expenses; SG&A Expenses; Product Quality Costs (warranty costs); ROI; ROA; Total Manufacturing Costs; Labor Costs; Material Costs; Indirect (overhead) Costs; Manufacturing Process Improvement Costs...

8) **Estimate the Number of Internal Operating (Non-Financial) Measures you use to monitor performance, or which are used to measure your performance.** (see following sample list to help estimate number of measures used)

Information Technology (% cost); New Product % of Sales; Proprietary Products % of Sales; New Product Introduction vs Competitors; Manufacturing Process Capabilities; Time to Develop Next Generation of Products; Product quality (defect rates); Delivery (on time); Manufacturing Efficiency; Suppliers (quality, defect rates, dependability, on time delivery); Suppliers (number of); R&D (new product introduction cycle time); Production Volume; Labor Productivity (hours used, available, overtime); Machine Productivity (hours running, available, downtime); Material Usage (inefficiency, waste); Setup Efficiency (setup time, number of setups); Manufacturing Cycle Time (total process time); Inventory (turnover); Product Defects (number of errors, rework, scrap)...

9) **Estimate the Number of Employee Related (Learning and Growth, Non-Financial) Measures you use to monitor performance, or which are used to measure your performance.** (see following sample list to help estimate number of measures used)

Safety (number of accidents, injuries); Employee Satisfaction (surveys, grievances); Employee Skills (level of education, experience); Employee Empowerment (# suggestions, # on improvement teams); Employee Training/Education (hours or time allocated for training); Employee Loyalty / Turnover; Absenteeism; Employee Perception of Leadership...

10) **Estimate the Number of Customer (Non-Financial) Measures you use to monitor performance, or which are used to measure your performance.** (see following sample list to help estimate the number of measures used)

Customer Acquisition (# new, % sales from new); Customer Retention / Loyalty (# repeat customers); Customer Satisfaction (surveys, complaints); Phone System Utility (automated, response time); Market Share; Time to Fill Customer Orders; Deliver Performance (on-time, % correct delivery); Time to Respond to Customer Problems; Flexibility/Responsiveness (ability to vary product)...

11) **Rank in order from most important to least important the process types related to performance measures you use or by which your performance is measured.**

1) Choose One
2) Choose One
3) Choose One
4) Choose One

12) **Comments or suggestions?**

Any comments or suggestions you might have regarding this survey would be appreciated at this time. Thank you for your participation.

By clicking the Submit Survey button below I acknowledge that I have read the consent form and agree to participate in this study.

Submit Survey

Online Survey Software powered by Vovici.

Note: Question 11 offers the following options presented in random sequence:

Rank in order from most important to least important the process types related to performance measures you use or by which your performance is measured.

Add Multiple Responses... Response Library

Identity Processes (processes that define your company)	0
Priority Processes (processes that are critical to support the identity of your company)	1
Background Processes (processes that are necessary support to daily operations)	2
Mandated Processes (processes necessary for regulatory compliance)	3